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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly pulication of the Chemical Information Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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80-1201. Deichmann, W. B., ed. (Sch. Med., Univ. Miami, Miami, FL) **Toxicology and Occupational Medicine.** *Dev. Toxicol. Environ. Sci.* 4: 480 pp.; 1979.

The papers in this volume were presented at the 10th Inter-American Conference on Toxicology and Occupational Medicine. Research reports on carcinogenic safety, and toxicological and pharmacological evaluation of occupational chemicals, pesticides and natural toxins are covered. Epidemiological, toxicological, and residue monitoring studies of PCP, carbaryl, organophosphates and organochlorine pesticides are presented. Abstracts of items from this volume will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

80-1202. Bazhanova, N. V.; Arutiunian, Zh. A. (Res. Inst. Plant Protection, Erevan, USSR) **O kolichestvennykh izmeneniyakh pigmentov plastid v list'yakh yablon' pal'mettnykh sadov v svyazi s primeneniem gerbitsidov. [Quantitative changes of plastid pigments in apple leaves in palmette orchards treated with herbicides.]** *Dokl. Akad. Nauk Arm. SSR* 69(1): 61-64; 1979 (8 references) (Russian).

The effect of the herbicides diuron, Karagard (terbumeton), linuron, Radokor and terbacil on the level of pigments in apple leaves was evaluated. Samples of leaves were obtained from an orchard systematically treated with the herbicides. Gas-chromatographic determination of chlorophylls *a* and *b*, carotene, lutein, and violaxanthin showed that herbicides increased accumulation of chlorophylls and carotenoids throughout the vegetative period.

80-1203. McDonald, D. (Author address not given) **Pesticide usage: prodigal or precise.** *Int. Pest Control* 22(1): 12-16; 1980.

The development of pest resistance to pesticides, the cost of pesticides (development, testing and registration costs) and the effects of pesticides on the environment are given as reasons for the use of less pesticides. A new development in spraying technology, the electrostatic sprayer, is discussed. Entire target coverage, reduced pesticide drift, effective spraying under a wide variety of weather conditions, minimized operator and environmental contamination, and the use of a lower total volume of pesticide are listed as advantages of the electrostatic sprayer. Pheromones can be used as aids in monitoring insect pest levels and for direct control of pests by mass trapping and disruption. Commercial difficulties in the development of pheromones, the use of sex pheromones for communication disruption in *Pectinophora gossypiella,* and the arrestant effect of a new contact sex pheromone for the tsetse fly *Glossina morsitans morsitans,* are discussed. A discussion of pyrethroid pesticides is also included. It is suggested that more effective use of pesticides could be attained through integrated pest management programs involving the use of resistant varieties, biological control (including pest predators) and better use of chemicals.

80-1204. Lagunov, A. G. (Agric. Inst., Volgograd, USSR) **Vliyanie insektitsidov na opadenie zavyazi plodov yabloni. [Effect of insecticides on shedding of young apple fruits.]** *Khim. Sel'sk. Khoz.* 18(1): 34-36; 1980 (11 references) (Russian).

An attempt was made to evaluate the effect of the insecticides Rogor (dimethoate), phosalone and Sevin (carbaryl) on young apple fruits. Model apple trees were sprayed with insecticides at a rate of 1,500 *l*/ha; the number of fruits was determined prior to the spraying and on days 5, 10 and 15 after the sprayings. Increased shedding of young fruits was recorded only within the first 2 wk of spraying. The increase was less pronounced after spraying with Sevin.

80-1205. Bachthaler, G.; Fischbeck, G. (Bayer. Landesanst. Bodenkult. Pflanzernbau., Tech. Univ. Muenchen, Weihenstephan, BRD) **Mutagene Wirkung von Herbiziden bei Kulturpflanzen - kritische Wertung des aktuellen Kenntnisstandes. [Mutagenic effect of herbicides on plants - critical evaluation of the actual scientific knowledge.]** *Nachrichtenbl. Dtsch. Pflanzenschutzdienstes (Braunschweig)* 31(2): 22-27; 1979 (69 references) (German).

The mutagenic effects of herbicides on cultivated plants were reviewed. With the exception of a few publications dealing with the meiotic effects of herbicide treatments, most papers are restricted to the mitotic effects of pesticides. Among contact-herbicides phenolic compounds appear to induce polyploidy in plants. Reports concerning the cytologic effects of triazine herbicides are contradictory, but there is general agreement that propham (IPC) and chloropropham (CIPC) act as strong mitotic inhibitors. Point mutations have been reported after applications of certain urea derivatives. It is concluded that correct herbicide applications are not important causes of genetic changes in crop plants.

80-1206. Mathews, J. (Author address not given) **Union press for herbicide ban.** *New Sci.* 85(1195): 558-560; 1980.

An argument is presented for the emergency banning of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in Great Britain. Unions representing agricultural and forestry workers are calling for the ban of the herbicide, which contains the impurity tetrachlorodibenzodioxin (TCDD or dioxin). Dioxin is considered a most toxic substance and is a proven teratogen and carcinogen. Some incidents of TCDD exposure are cited: the high rate of miscarriages in Alsea, Oregon (near an area sprayed with 2,4,5-T) in 1973-1978; the 1976 accidental leak of TCDD near Seveso, Italy;

and the cancer death in 1978 of a veteran who had flown several herbicide spraying missions in Vietnam. The reduced use of 2,4,5-T in several countries (including Italy, Sweden, The Netherlands and the United States) is discussed, with emphasis on the steps taken by the EPA.

80-1207. Anonymous **Cotton insect research and control. II. Genetic control.** *Pesticides* 13(10): 3-4; 1979.

An update on the state of genetic pest control is presented. Specific examples provided are the boll weevil, bollworm, tobacco budworm, and the pink bollworm. Boll weevils irradiated with gamma rays have exhibited reduced competitiveness and high mortality. Sterilization of males proved to be too costly. Sterilization of both sexes was obtained with a busulfan diet. A combination dietary-irradiation program is hoped to result in future high levels of sterilization. Bollworm and tobacco budworm sterilization has been conducted with γ-irradiation, but the methods have not proven to be very satisfactory. Sterile moths of the pink bollworm have been released in California (100-412 million/yr). It is suggested that this program must be continued and expanded if this pest is to be eliminated.

80-1208. Osmani, Z.; Anees, I.; Sighamony, S. (Reg. Res. Lab., Hyderabad 500009, India) **Juvenile hormone like activity of methyl eugenol.** *Pesticides* 13(11): 5-8; 1979 (11 references).

Studies were performed to determine the juvenile hormone-like activity of methyl eugenol (MEU) on housefly eggs, larvae and pupae. At 1000 ppm, egg mortality was 100%, and 80 μg/larvae applied topically produced 100% mortality. Lower concentrations inhibited development and caused abnormalities. Eighty μg/pupae caused 100% mortality, but 50 μg/pupae only inhibited growth and caused abnormal development. It is concluded that the compound mimics juvenile hormone activity.

80-1209. Murthy, R. L. N. (UPASI Tea Res. Stn., Cinchona 642106, Tamil Nadu, India) **Physiological and contact activity of diflubenzuron against *Spodoptera litura* larvae.** *Pesticides* 13(12): 33; 1979 (2 references).

Last instar larvae (22 days old) of the tobacco cutworm (*Spodoptera litura* were allowed to feed for 3 days on tea leaves sprayed with 0.025% diflubenzuron. To test contact action of the pesticide, another group of the larvae were sprayed with the dilute preparation. Most of the larvae that fed on treated leaves became black, dehydrated, and shrunken, and 58 of 59 died on the fourth day. Sprayed larvae also became shrunken and also died on the day after the last spray.

80-1210. Sheets, T. J., ed.; Pimentel, D., ed. (North Carolina State Univ., Raleigh, NC) **Pesticides. Contemporary Roles in Agriculture, Health, and Environment.** *Pesticides. Contemporary Roles in Agriculture, Health and the Environment. (Humana Press: Clifton, NJ):* 208 pp.; 1979.

The impacts of pesticides on agriculture, human health and the environment are covered in this volume. Pesticide roles in increasing and stabilizing agricultural production and in pest management, the socioeconomic impact, cost-benefit analysis and energy requirements of pesticide use, and the effects of pesticides on human health, the environment and non-target organisms are individually reviewed. US pesticide production and use data from 1952 to 1976 are discussed; 1976 estimates indicate 26% of major crop acreage were treated with some type of pesticide. Past environmental pollution is briefly reviewed. Monitoring of and research on pesticide activity is considered necessary to avoid possible environmental pollution and adverse effects on human health by unforeseen deleterious action of new pesticides. At the same time future regulatory action will have to take into consideration the beneficial aspects of pesticides on controlling pest populations on world crops. Abstracts of papers from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

80-1211. Tschirley, F. H. (Dep. Bot. & Plant Pathol., Michigan State Univ., East Lansing, MI) **The role of pesticides in increasing agricultural production.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 3-20; 1979 (20 references).

Trends in total pesticide, insecticide, fungicide and herbicide production and alternative insect, plant disease and weed control methods are discussed with respect to the need for increased agricultural production. Insect hormones and pheromones are considered environmentally safe alternatives to chemical insecticides since they are species specific and degrade rapidly. However, because they do not have broad spectrum action and development costs are high, they have a low market potential. It is theorized that resistance will not develop to these hormones and pheromones, but some insects have been noted to be cross resistant to juvenile hormone analogs and currently used insecticides. Bacteria and virus insect controls are effective agents. The possibility of a naturally occuring deleterious mutation in a microbial agent with could lead to infection in other species is considered. Predators and parasites are useful supplements to chemical control but are not feasible as main controls. Cultural practices that would reduce the amount of pesticides are the major alternatives to chemical fungicides and herbicides, but are not considered sufficiently effective to reduce the use of chemicals.

80-1212. Carlson, G. A. (North Carolina State Univ., Raleigh, NC) **The role of pesticides in stabilizing agricultural production.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 21-35; 1979 (15 references).

Problems associated with pesticide stabilized agricultural production include phytotoxicity, interactions with environmental conditions that reduce crop yield and elimination of natural pest enemies. Increased yield variability can also arise from increased genetic resistance induced by using large amounts of pesticides. Different pesticide use regimes are reviewed with respect to yield variability and profit variability. Experimental data from high insecticide use, low insecticide use, field scouting, pest management consultations and other alternative pest control technologies are examined. Regulations and government policies which can enhance yield stability and increase yields are also discussed.

80-1213. LaDue, E. L. (Cornell Univ., Ithaca, NY) **Socioeconomic impacts of changes in pesticide usage.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 37-55; 1979 (51 references).

Modifications in chemical pest control which have increased the production of most agricultural commodities were viewed to have a net positive impact on society as a whole until the last decade. Negative impacts of pesticide use are now considered when cost-benefit analyses of chemical pest control are performed. Environmentally directed legislation has been directed toward reducing exposure to toxic chemicals, decreasing the number of animal deaths and fish kills, and minimizing the probability of developing cancer. The economic value of this legislation has not been determined, however. The economic impacts of changing pesticide use to a single farm, the aggregate of all farms, regionally and to the consumer are reviewed.

80-1214. Berry, J. H. (Author address not given) **Pesticides and energy utilization.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 57-71; 1979 (12 references).

The energy efficiency of pesticides can be increased by returning to pest management practices developed before the introduction of synthetic pesticides. These practices when combined with chemical pest control will provide optimal integrated pest management. Biological controls are noted to reduce energy requirements, lower control costs and be less environmentally hazardous. Improvements in effectiveness of pesticide applications, such as improved spray techniques and equipment, the use of spot treatments and elimination of cosmetic sprays are suggested to increase pesticide energy efficiency.

80-1215. Newsom, L. D. (Dep. Entomol., Cent. Agric. Sci. & Rural Dev., Louisiana State Univ., Baton Rouge, LA 70803) **Role of pesticides in pest management systems.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 151-173; 1979 (12 references).

Integrated pest management (IPM) systems are described. The dependence on herbicides for weed control is examined. The development of weed resistance to herbicides, the problems of accumulation of residues in non-target organisms and indications of herbicide toxicity to predators and parasites are briefly reviewed. Insecticide overuse is also examined. The use of biological predators and parasites is noted to reduce systematic applications of unnecessarily large amounts of broad spectrum insecticides. Steps for implementing IPM systems for insect control that take into consideration unacceptable levels of environmental pollution and adverse effects on non-target organisms are listed.

80-1216. Mrak, E. M. (Author address not given) **Attitudes concerning industrial and especially pesticide chemicals in the United States.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 543-549; 1975.

A review of historical use and projections of future use of agricultural pesticides, as well as changes in attitudes toward pesticides, are presented. Special attention is given to the gradual increased objections by the general public to DDT use. The lack of consultations with the scientific community by government officials in making new policy and regulations concerning environmental problems is considered. The establishment of the Council of Environmental Quality (CEQ) and the EPA and their roles in determining pesticide legislation is reviewed. The need for increased world food production and alternatives to chemical pest control, such as microbial, botanical and virus insecticides, are discussed.

80-1217. Rohmer, A. (Cent. Hosp. Univ., Strasbourg, France) **Lipides, glucides, enzymes et pesticides du lait de femme. [Lipids, sugars, enzymes and pesticides in human milk.]** *Aliment. Vie* 66(3): 131-143; 1978 (29 references) (French).

The chemical and biochemical composition of human milk is reviewed and the chemistry and function of lipids, fatty acids, the importance of linoleic acid, lactose, oligosaccharides and enzymes is discussed. Pesticides found in human milk samples include HCB (hexachlorobenzene), HCH (BHC), aldrin, dieldrin, heptachlor, heptachlor epoxide and DDT. It is suggested that pesticide residues derive primarily from vegetables, meat and milk, as indicated by a drop in DDT content when its use in agriculture was banned and its content in cow milk decreased. Human milk is more contaminated than cow milk, which is explained by the fact that humans are the end link of the food chain. The danger inherent in this contamination and the need to reduce it is discussed. Special attention is drawn to the widespread use of insecticides in households to control flies and insects, which results in the inhalation of inordinate quantities of noxious chemicals.

80-1218. Goes, E. A.; Savage, E. P.*; Gibbons, G.; Aaronson, M.; Ford, S. A.; Wheeler, H. W. (Colorado Epidemiol. Pestic. Stud. Cent., Inst. Rural Environ. Health, Colorado State Univ., Fort Collins, CO 80530) **Suspected foodborne carbamate pesticide intoxications associated with ingestion of hydroponic cucumbers.** *Am. J. Epidemiol.* 111(2): 254-260; 1980 (13 references).

Two outbreaks of related food borne illness that occurred over a year apart in southwestern Nebraska are reported. In both cases, the illness was preceeded by the ingestion of hydroponic cucumbers. In 1977, nine victims reported the onset of illness (diarrhea, vomiting, blurred vision, abdominal pain, muscle fasciculation) within 15 min to 2 hr 15 min after ingestion of the cucumbers. All victims recovered quickly and completely, without specific medical treatments for their illnesses. The remaining cucumbers were analyzed for organophosphates by gas-liquid chromatography and for lead, arsenic, mercury, and selenium by atomic absorption spectrophotometry. None of these substances were detected. Thin layer chromatography indicated that a carbamate (a reversible cholinesterase inhibitor) was present, but lack of proper standards prevented more specific identification. In 1978, five residents of an adjacent city became seriously ill after ingesting cucumbers grown in the same greenhouse. In some cases, individuals sharing the same cucumber both became ill. Two randomly selected cucumbers from the supermarket were analyzed by a gas chromatograph equipped with a flame photometric detector, and were found to contain 6.6 and 10.7 ppm of the carbamate aldicarb. Greenhouse materials were also tested, and those found to be contaminated with aldicarb were: water-nutrient solutions (1.8 ppm) and gravel from the cucumber bed (0.6 ppm). The source of aldicarb in the greenhouse could not be determined.

80-1219. Perfect, J. (Southeast Asian Reg. Cent. Grad. Stud. & Res. Agric., Makati, Metro Manila, Philippines) **The environmental impact of DDT in a tropical agro-ecosystem.** *Ambio* 9(1): 16-21; 1980 (13 references).

The effects of DDT on soil organic matter decomposition and soil fauna were investigated. Individual test plots on a 0.5 acre site were either cleared of growth, allowed to remain as thicket, or cleared and cultivated with cowpea. DDT (10 kg/ha) was applied to pea plants at the crop sites during the first growing season of each of 4 consecutive years (contaminated plots) or sprayed in all growing seasons except the first (treated plots). Treated topsoil DDT residues (ΣDDT; *p,p′*-DDT, *o,p′*-DDT, and *p,p′*-DDE) over the first 2 yr increased to 1.5-1.7 μg/g soil in the 0-30 cm soil horizon, then declined over the next 2 yr to 0.6-1.2 μg/g soil. Appreciable amounts of the pesticide were accumulated by the cowpea plants, and there was evidence of translocation from the shoots to the root system. Populations of crickets, millipedes, ants, and spiders were significantly reduced ($p < 0.05$) in both contaminanted and treated plots. Spiders, in particular, were affected, and suffered > 50% reduction in numbers over a 2 yr period. The rate of litter decomposition was significantly reduced ($p < 0.05$) by DDT treatments. Leaf decomposition in treated plots was almost 50% less than in comparable untreated plots.

80-1220. Piffaut, B.; Metche, M. (Lab. Biochem., Ec. Brass., F-54000 Nancy, France) **Modele d'aggravation de la toxicite d'un pesticide par l'intermediaire d'une algue terrestre. Consequences eventuelles sur le plan alimentaire. [Scheme of a pesticide toxicity improvement by an earthly algae. Possible implications in relation to alimentation.]** *Ann. Nutr. Aliment.* 33(4): 535-536; 1979 (French).

It was determined that the acaricide/fungicide Morestan (quinomethionate) is biodegraded by the cucumber plant. Dithioquinomethionate was not found to accumulate in the cucumber fruit. A unicellular green algae found in the rhizosphere of the plant was able to biodegrade quinomethionate with formation of 6met-2amino-3chloroquinoxaline (a halogen derivative), which is herbicidal to the cucumber plant. Quinomethionate alone also had a mild toxicity. It is suggested that biohalogenation of quinomethionate may also occur with other algae, and that biomagnification of toxic activities may occur.

80-1221. Suess, A. (Bayer. Landesanst. Bodenkultur & Pflanzenbau, Freising-Muenchen, BRD) **Verhalten von Monolinuron (Aresin) und Atrazin (Gesaprim) im Feldversuch. [Behavior of monolinuron (Aresin) and atrazine (Gesaprim) in field trials.]** *Bayer. Landwirtsch. Jahrb.* 55(5): 565-570; 1978 (12 references) (German).

^{14}C Methyl labeled monolinuron and ^{14}C ring labeled atrazine were applied on the soil surface and in the upper 5-cm soil layer. Radioactivity was measured in the soil

and in corn, wheat, and carrot plants for several years after application. In the plants grown in monolinuron treated soil, radioactivity was detectable only during the first year. The residual radioactivity found in the soil 4-5 yr after application was 5-8% of the original level. Radioactivity was found in the plants grown in atrazine treated soil in all 5 yr of the experiment. About 90% of the applied radioactivity was found in the soil after 4 yr. It was concluded that the uptake of atrazine by the plants was reduced by the strong sorption of this substance by the soil.

80-1222. Crisetig, G.; Carpene, E.; Cattani, O.; Serrazanetti, G. (Ist. Biochim., Fac. Med. Vet., Univ. Bologna, Bologna, Italy) **Dealogenazione di *p,p'*-DDT in *p,p'*-DDD nella frazione microsomiale nel fegato di *Mugil cephalus*. [Dehalogenation of *p,p'*-DDT to *p,p'*-DDD in the microsomal fraction of the grey mullet liver.]** *Boll. Soc. Ital. Biol. Sper.* 55(12): 1224-1227; 1979 (5 references) (Italian).

Dehalogenation of *p,p'*-DDT to *p,p'*-DDD (*p,p'*-TDE) in tissues of aquatic life was studied on the grey mullet (*Mugil cephalus*) by adding the cofactors NADPH and riboflavin to the homogenized liver, incubating the samples for 2 hr at 42°C, and determining the product in a purified hexane extract by gas chromatography. At ambient temperature in the incubation system conversion of DDT to DDD was complete. Without the cofactors the conversion was 80% complete. After heat pretreatment, however, complete anaerobic reductive dechlorination occurred whether or not exogenous NADPH and riboflavin were added.

80-1223. Boyle, T. P.; Robinson-Wilson, E. F.; Petty, J. D.; Weber, W. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO) **Degradation of dentachlorophenol *(sic)* in simulated lentic environment.** *Bull. Environ. Contam. Toxicol.* 24(1): 177-184; 1980 (22 references).

Four simulated lentic environments were used to study the degradation of PCP, the formation of TCP (trichlorophenol) and PCA (pentachloroanisole) and metabolite distribution into various components of the environment. PCP was added at 2 mg/l and ^{14}C-PCP at 5 μCi to the simulated systems: (1) oxygen rich euphotic epilimnion; (2) oxygen rich euphotic littoral zone; (3) low oxygen, dark hypolimnion; and (4) benthic hydrosoil hypolimnion. Water samples were taken for PCP analysis on days 1, 4, 10, 14, 21, 28, 35, 42, 68, 73, 106, 124 and 131 after treatment. Samples of the hydrosoil, filamentous algae, biogenic sediment, and floating flocculent material from each aquaria were also analyzed for PCP. Gas chromatographic studies of water samples showed the greatest PCP levels in aquaria without mud (1 and 3) varied between days 21 and 68. PCA was found in trace amounts (2 μg/l) in aquaria 1 and 2. One TCP isomer was detected in the hydrosoil of aquaria 2 and 4. Radiometric studies revealed the amount of ^{14}C activity of PCP and unknown degradation products was least in aquarium 1. Hydrosoil of aquarium 2 contained over 3 times the ^{14}C activity of the hydrosoil sampled from aquarium 4. Significant levels of ^{14}C were also found in algae, floating flocculent matter and biogenic sediment. From these findings it was concluded that the conversion of PCP to TCP occurs mainly in the hydrosoil, and PCP is probably most persistent in the deoxygenated hypolimnion waters of lakes.

80-1224. McCall, P. J.; Swann, R. L.; Laskowski, D. A.; Unger, S. M.; Vrona, S. A.; Dishburger, H. J. (Agric. Prod. Dep., Dow Chem. USA, Midland, MI) **Estimation of chemical mobility in soil from liquid chromatographic retention times.** *Bull. Environ. Contam. Toxicol.* 24(1): 190-195; 1980 (7 references).

A new technique combining data from column leaching and HPLC experiments has been used to develop a soil mobility classification system for various chemicals. HPLC retention times, soil absorption coefficient values (K*oc*), and extent of column leaching were determined for DDT, chlorpyrifos, trifluralin, diuron, nitrapyrin, lindane, carbaryl, carbofuran, and 2,4-D on three types of soils. Results showed a definite positive correlation between retention time, K*oc*, and leaching distance. When the natural log of K*oc* versus the natural log of retention time is plotted, a linear relationship is generated which may be used to estimate K*oc* values for any chemical whose retention time is unknown. Since retention time estimates will vary according to HPLC equipment used, it is suggested that instruments be calibrated by a set of standard compounds. It was also noted that soil with lower organic carbon content displayed the least absorption, hence greater leaching of chemicals occurred with increased soil organic carbon content.

80-1225. Ueji, M.; Kanazawa, J. (Natl. Inst. Agric. Sci., Yatabe, Ibaraki 305, Japan) **Uptake and translocation of *o-sec*-butylphenyl *N*-methylcarbamate (BPMC) and *O,O*-di*iso*propyl *S*-benzyl phosphorothiolate (IBP) in rice plants applied as single and mixed preparations.** *Bull. Environ. Contam. Toxicol.* 24(1): 204-210; 1980 (11 references).

BPMC, a carbamate insecticide, was applied singly or in mixture with IBP to rice plants grown in Wagner pots on alluvial soil. IBP was also applied separately to pots of rice plants. A 250 mg dose of each pesticide preparation was used on each 5×10^{-4} ha area and rice plants were sampled at 1, 3, 5, 8 and 15 days after treatment. IBP and BPMC were determined in roots, leaf sheath, and leaf blade by gas-liquid chromatography to study translocation of the pesticides in rice plants. BPMC concentrations were maximum in roots and leaf sheath on the first day after treatment. In leaf blade, BPMC was found at maximum

levels on day 3 following treatment. This trend was similar for mixed preparations of BPMC and IBP. A decline in uptake of BPMC corresponded to a disappearance of this insecticide from flood water and soil, and the degradation of BPMC in the rice plants themselves. At 15 days post-treatment, BPMC residues were less than 0.2 ppm. For IBP, maximum levels were found at 3 days after treatment in roots and leaf sheath, and 5 days after treatment in leaf blade. The degradation of IBP in rice plants was markedly slower than that of BPMC; at 15 days post-treatment IBP levels were ten times higher than BPMC levels in all parts of the rice plants. The uptake by rice plants of BPMC was much greater than that of IBP.

80-1226. Jensen, K. I. N.; Kimball, E. R. (Res. Stn., Agric. Canada, Kentville, Nova Scotia B4N 1J5, Canada) **Persistence of dinitramine and trifluralin in Nova Scotia, Canada.** *Bull. Environ. Contam. Toxicol.* 24(1): 238-243; 1980 (14 references).

Plots of loamy sand soils near Kentville, Nova Scotia were treated with 1.0 and 0.75 kg/ha of trifluralin and dinitramine, respectively, in November of 1977. The same areas were treated with 0.75 kg/ha of trifluralin and 0.5 kg/ha of dinitramine in May 1978. Soil samples were periodically taken from random locations and frozen until gas chromatographic analysis. Overwinter losses of the herbicides from the soil were 55.4 and 38.1% for dinitramine and trifluralin, respectively. After the spring application, significant losses of dinitramine from Berwick and Somerset soil, and of trifluralin from Berwick soil were observed near the end of June. The relative rate of disappearance of dinitramine was more rapid than that of trifluralin in both soils. Implications of herbicide residue persistence in soil to crops, and factors influencing residue degradation were also considered.

80-1227. Morgade, C.; Barquet, A.; Pfaffenberger, C. D. (Dep. Epidemiol. & Public Health, Chem. Epidemiol. Div., Sch. Med., Univ. Miami, Miami, FL 33177) **Determination of polyhalogenated phenolic compounds in drinking water, human blood serum and adipose tissue.** *Bull. Environ. Contam. Toxicol.* 24(1): 257-264; 1980 (8 references).

Fifty-eight white females from Dade County, Florida were analyzed for the presence of 2,4-dichlorophenol (2,4-DCP); 2,3,5-trichlorophenol (2,3,5-TCP); 2,4,5-TCP; 2,4,6-TCP; 2,5-dichloro- 4-bromophenol (2,5-DC-4-BP); 2,3,4,5-tetrachlorophenol (2,3,4,5-TTCP); 2,3,4,6-TTCP and PCP in their blood serum by GLC. Each subject had been following her own drinking water usage patterns for at least 5 yr; 33 drank municipal chlorinated drinking water while the remaining 25 generally used non-chlorinated drinking water from wells. Faucet samples taken from 12 of the chlorinated and 10 of the non-chlorinated drinking water supplies were also analyzed for the same 8 halogenated phenols by GLC. In addition, 10 samples of human adipose tissue taken at autopsy were subjected to GLC analysis to determine halogenated phenol content. Only PCP was detected in the water and biological samples analyzed. PCP residue levels in municipal water samples were nearly double those in well water samples. No significant differences were found in serum PCP levels between users of municipal water and users of well water. PCP levels in the 10 adipose specimens ranged from 5 to 52 ppb. The GLC methods used for halogenated phenol determinations were individually modified to accommodate small sample size and are described in detail.

80-1228. Buck, N. A.; Estesen, B. J.; Ware, G. W. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721) **Dislodgable insecticide residues on cotton foliage: fenvalarate (sic), permethrin, sulprofos, chlorpyrifos, methyl parathion, EPN, oxamyl, and profenofos.** *Bull. Environ. Contam. Toxicol.* 24(1): 283-288; 1980 (3 references).

Test plots of cotton plants were treated with various formulations of insecticides in two separate studies in order to determine the easily dislodgable residues over a 4 day period after application. In the first experiment, the formulations applied and approximate rates of active ingredients (AI)/ha were: Bolstar 6 (sulprofos) 6 EC, 1.1 kg/ha; Pydrin (fenvalerate) 2.4 EC, 0.22 kg/ha; Pounce (permethrin) 3.2 EC, 0.22 kg/ha; and Lorsban (chlorpyrifos) 4 EC, 1.1 kg/ha. Leaf punch samples were taken at 0, 24, 48, 72, and 96 hr after insecticide treatment. Leaf extracts were analyzed by gas chromatography and the 96 hr residues, in order of their persistence, were found to be fenvalerate > permethrin > sulprofos > chlorpyrifos. In the second study, the formulations applied and approximate rates of AI/ha were: methyl parathion + EPN (3 + 3 EC), 1.1 + 1.1 kg/ha; Bolstar (6 EC), 1.1 kg/ha; Vydate (oxamyl) (2 EC), 0.41 kg/ha; Pounce (3.2 EC), 0.17 kg/ha; Curacron (profenofos) (6 EC), 1.1 kg/ha; and toxaphene + methyl parathion (6 + 3 EC), 2.2 + 1.1 kg/ha. Leaf punch samples and gas chromatographic analysis of leaf extracts were carried out according to the same schedule used in the first study. Results revealed that methyl parathion combined with toxaphene was more stable than when it was in combination with EPN. EPN residues were more persistent than methyl parathion residues and were similar to residual lives of sulprofos and profenofos. Oxamyl and permethrin were also very similar in residue patterns and were the most persistent of all insecticides tested.

80-1229. Pipe, A. E.; Cullimore, D. R. (Microbiol. Unit, Dep. Biol., Univ. Regina, Regina, Saskatchewan S4S 0A2, Canada) **An implanted slide technique for examining the effects of the herbicide diuron on soil algae.** *Bull. Environ. Contam. Toxicol.* 24(1): 306-312; 1980 (23 references).

A modified Rossi-Cholodny buried slide technique was used to study the *in situ* effects of diuron application to soil on populations of algae. Diuron was applied to enriched heavy clay soil to achieve final herbicide concentrations of 1, 5, and 10 ppm (dry soil) to simulate conditions which would most likely occur in the field. Microscope slides were inserted into the soil and incubated for 30 days at 20°C under continuous illumination and constant moisture conditions. After incubation the slides were dried, cleaned of soil and laminated with agar to be examined at a later date. Separate studies showed the level of diuron in the top 2 cm of soil to be consistent with the doses applied, since the herbicide, when absorbed, was not available for uptake by microorganisms. Control slides planted in untreated soil most frequently contained the genera *Chlorella, Hantzschia, Navicula, Oscillatoria,* and *Stichococcus.* Only *Chlorella* and *Hantzschia* were found on slides exposed to 1 ppm diuron. Slides exposed to 5 ppm diuron contained *Hantzschia* in low numbers, while slides exposed to 10 ppm diuron showed no colonization by this diatom. Algal populations were reduced by greater than 99% at depths of 0 to 10 mm in soil with 1 ppm diuron. Since the presence or absence of an algal genus on the slide was a function of its proximity to the slide in the soil, movement of the algae towards the slide, and the ability of the algae to adhere to the slide, these results were not interpreted as lethal effects of diuron on soil algal populations, but only as effects of the herbicide on algal colonization processes.

80-1230. Heikes, D. L. (US FDA, Kansas City, MO 64106) **Residues of pentachloronitrobenzene and related compounds in peanut butter.** *Bull. Environ. Contam. Toxicol.* 24(3): 338-343; 1980 (13 references).

Studies were performed to determine the levels of residues of pentachloronitrobenzene (quintozene) and related compounds in peanut butter. Fats and oils were extracted with ethyl ether and petroleum ether. Following florisil cleanup, analyses were performed using gas chromatography with electron capture detection. Residues in highest concentrations in the 11 samples analyzed were pentachloroaniline at 140 ppb, pentachlorothioanisole at 61 ppb, pentachlorophenol (PCP) at 64 ppb, and pentachlorobenzene at 62 ppb. Tetrachloronitrobenzene was lowest in the samples, ranging from 0.42 to 4.3 ppb. Residues of these compounds are suggested to result from soil fungicide and seed disinfectants used in peanut farming.

80-1231. Drifmeyer, J. E.; Rosenberg, C. L.; Heywood, M. A. (Environ. Hyg. Ag., US Army, Aberdeen Proving Ground, MD 21010) **Chlordecone (Kepone) accumulation on estuarine plant detritus.** *Bull. Environ. Contam. Toxicol.* 24(3): 364-368; 1980 (16 references).

Dead leaves of giant cord grass were collected from an area where no Kepone (chlordecone) could be detected in the water (< 50 ppt) and were suspended in a creek where Kepone was detected in the sediments (up to 10 ppm) and in the water column (1-4 ppb). Samples were collected after 14, 42, 83 and 119 days, and Kepone levels in the detritus were determined by electron capture gas chromatography. Kepone concentrations increased with time. After 14 days, 0.5 μg/g were detected; after 83 days, 2.2 μg/g were detected; and after 119 days, 4.5 μg/g were detected. The accumulation of Kepone into detritus provides an entry of the contaminant into estuarine food webs.

80-1232. Chendrayan, K.; Sethunathan, N. (Cent. Rice Res. Inst., Cuttack 75306, India) **Effects of HCH, carbaryl, benomyl and atrazine on the dehydrogenase activity in a flooded soil.** *Bull. Environ. Contam. Toxicol.* 24(3): 379-382; 1980 (7 references).

Flooded soils were used to test the effects of some commonly used pesticides on the dehydrogenase activity in the soil, a measure of the metabolic activity of soil microorganisms. Air-dried alluvial soil samples were flooded with distilled water to provide 3 cm standing water over the soil. Commercial formulations of the pesticides HCH (BHC), carbaryl, benomyl, and atrazine at rates of 1, 10 and 100 μg AI/g soil were added at the time of flooding and incubated for various periods. The redox potential was determined, and soil dehydrogenase activity was assayed by the 2,3,5-triphenyl tetrazolium chloride (TTC) reduction method. All pesticides except atrazine prevented the accumulation of dehydrogenase activity. Benomyl was the most effective in inhibiting the dehydrogenase activity, followed by HCH and carbaryl. In examining the redox potential (a semi-quantitative index of the status of soil reduction), it was found that addition of benomyl or HCH retarded the drop in redox potentials. However, the inhibition of dehydrogenase activity was not necessarily related to high potentials, since carbaryl also inhibited the activity.

80-1233. Lakshminarayana, J. S. S.; Bourque, H. (Dep. Biol., Univ. Moncton, Moncton, New Brunswick E1A 3E9, Canada) **Adsorption of fenitrothion by plankton and benthic algae.** *Bull. Environ. Contam. Toxicol.* 24(3): 389-396; 1980 (26 references).

A preliminary survey was carried out to determine the response of plankton and benthic algae from Peabody Lake in New Brunswick, Canada to fenitrothion spray formulations. The active ingredient was applied at a rate of 210 g/ha by an airplane flying about 35-40 m above the tree tops. The spray formulation contained 11% fenitrothion, and spraying was done on June 3 and 19. Sampling was performed over the 24 hr period immediately following the first application, and at 48 hr after the second application. Nitrate and nitrite nitrogens, phosphate, calcium, magnesium, total hardness, chlorophyll *a,* phaephytin, phytoplankton, zooplankton, and benthic algae were determined from the water samples collected. Fenitrothion in

the water samples was determined by gas chromatography and was found to range between 0.06 and 0.9 μg/l. The highest concentration in a surface water sample (0.9 μg fenitrothion/l) was found 8.5 hr after the first application. At the 3 m depth, the concentration of fenitrothion continued to rise until after 13.5 hr post-spray; the highest concentration was 0.42 μg/l. The algae and zooplankton species found in the lake are listed. All phytoplankton net samples had fenitrothion residues during and after spraying; the highest concentration detected was 0.05 μg/l. Zooplankton showed maximum residues of 0.014 μg/l. The percentage of fenitrothion associated with the algae in the water column varied from 0.24 to 5.45%. The results indicate that fenitrothion will be absorbed or actively taken up by plankton, particularly the phytoplankton, with the degree of absorption dependent on various environmental factors.

80-1234. Wu, T. L.; Lambert, L.; Hastings, D.; Banning, D. (Chesapeake Bay Cent. Environ. Stud., Smithsonian Inst., Edgewater, MD 21037) **Enrichment of the agricultural herbicide atrazine in the microsurface water of an estuary.** *Bull. Environ. Contam. Toxicol.* 24(3): 411-414; 1980 (10 references).

Microsurface films, which are frequently seen in estuarine waters, result from the accumulation of water-insoluble metabolites and decay products, and often concentrate various pollutants. Microsurface and bulk subsurface water samples were collected twice a week from a station near the head of the Rhode River, a subestuary of the Chesapeake Bay, and examined for atrazine residues. Water samples were filtered through glass fiber filters to separate solid particles, and extracted prior to quantitation using a gas chromatograph equipped with a Hall electrolytic detector in the nitrogen mode. Atrazine was detected in microsurface and subsurface water throughout the entire June-December sampling period in both 1977 and 1978; the highest atrazine concentration (3.3 μg/l) was detected on August 4, 1977 in a microsurface sample. Atrazine ranged from 0.003 to 0.19 μg/l (mean 0.04 μg/l) in the bulk surface water and from 0.01 to 0.59 μg/l (mean 0.13 μg/l) in the microsurface water samples. The enrichment of atrazine in the microsurface varied from none to 110×, with 46% of the 65 sampling dates having an atrazine enrichment factor of 5× or less. A correlation existed between season and atrazine enrichment; high enrichment in the microsurface occurred between mid-September and late October for both years. The biological implications of the extreme atrazine enrichment during this period remains to be determined.

80-1235. Singh, B.; Dhaliwal, G. S.; Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana 141004, India) **Residues of quinalphos and phosalone it tomato.** *Bull. Environ. Contam. Toxicol.* 24(3): 423-426; 1980 (6 references).

Experiments were carried out to determine the decline of quinalphos and phosalone residues on tomatoes under north Indian climatic conditions. In field studies, tomato plants were sprayed with quinalphos at a rate of 0.250 kg AI/ha or phosalone at 0.437 kg AI/ha in May 1978. Marketable tomatoes were removed 0, 1, 2 and 4 days after spraying, extracted, and analyzed by gas chromatography. Quinalphos spray resulted in an initial deposit of 1.8 ppm on tomatoes, which was reduced to 1.2, 0.5 and 0.2 ppm on days 1, 2 and 4, respectively. These were reductions of 30, 72 and 88%, respectively. Since a general maximum residue limit of 0.25 ppm has been tentatively proposed for quinalphos residues, it is suggested that 3 days should elapse between spraying and marketing tomatoes. Phosalone residues were 1.7 ppm initially, with residues of 0.9, 0.7 and 0.4 ppm after 1, 2 and 4 days, respectively. Phosalone residues were below the prescribed maximum residue limit of 1 ppm on day 1.

80-1236. Wingfield, G. I. (Agric. Res. Council, Weed Res. Org., Yarnton, Oxford OX5 1PF, England) **Effect of asulam on cellulose decomposition in three soils.** *Bull. Environ. Contam. Toxicol.* 24(3): 473-476; 1980 (9 references).

Studies were designed to determine the effects of the herbicide asulam on cellulose substrates buried in soil. Three soils (two from arable fields and one from a permanent grassland) were tested, and 100% cotton Shirley Test Cloth was used in an effort to attain uniformity and reproducibility. Asulam was applied either to the soil (at a rate of 16 or 160 ppm on a dry soil basis) or to the cloth (at rates of 2 or 8 kg/ha) and the strips of cloth were then buried in soil and incubated for 8 wk. The strips were removed, cleaned and loss in weight (as % of initial wt) was determined. The results indicated that in soil I (arable), all asulam treatments significantly reduced weight loss of the test cloth. In soil II (arable), weight loss was significantly reduced in treated soil at 160 ppm, and in soil III (grassland), reduction was significant when treated cloth (8 kg/ha) was buried in untreated soil. In tests in which the asulam-treated soil was incubated for 10 wk before burial of the cloth, the inhibitory effects of the herbicide were partially alleviated in soil I and completely alleviated in Soil II. It is noted that Soil I, which showed the greatest herbicide effect, had lower organic-C, total-N, ammonium-N, nitrate-N, cation exchange capacity, and field moisture capacity than the other two soils. It is concluded that, where there is good contact between soil and herbicide, decreased breakdown of organic matter in the field following the use of asulam, if it occurs at all, is likely to be of short duration.

80-1237. Baarschers, W. H.; Bharath, A. I.; Hazenberg, M.; Todd, J. E. (Dep. Chem., Lakehead Univ., Thunder Bay, Ontario P7B 5E1, Canada) **Fungitoxicity of methox-**

ychlor and fenitrothion and the environmental impact of their metabolites. *Can. J. Bot.* 58(4): 426-431; 1980 (17 references).

The fungitoxicities of the insecticides methoxychlor and fenitrothion, and their metabolites, were investigated. Fungitoxicity was measured in terms of inhibition of mycelial growth in response to 1.6-400 ppm concentrations of the pesticides. Methoxychlor and methoxychlor olefin had relatively low toxic effects in soil fungi and in the aquatic fungus *Saprolegnia parasitica*, while the more polar dihydroxy derivatives (hydroxychlor, hydroxychloro olefin, and hydroxydichloromethyl) were highly toxic to all test organisms at 3.1-200 ppm concentrations. At the highest dose of 400 ppm fenitrothion only 55% of *S. parasitica* and 60% of *Mortierella isabelline* were completely inhibited. *S*-methyl fenitrothion and 3-methyl-4-nitrophenol were highly toxic to all species; 100 ppm *S*-methyl fenitrothion caused 100% inhibition of *S. parasitica*, and 400 ppm doses of the metabolite were completely fungistatic for *M. isabellina*, *M. pusilla*, and *Trichoderma viride*.

80-1238. Anonymous **Aldrin and dieldrin found at Cargill sites.** *Chem. Mark. Rep.* 217(11): 7, 21; 1980.

The appearance of aldrin and dieldrin, 2 highly stable pesticides banned in 1974 as carcinogens, at 2 Iowa grain elevators has resulted in the quarantining of 33,000 hogs and 3500 cattle which may have consumed corn contaminated with the pesticides. Soil samples near the grain elevators were found by the USDA to contain up to 2.7 ppm of the pesticides (Federal standard 0.03 ppm). It is presumed that the contaminated soil was picked up as the feed was loaded into the storage elevators. The USDA has expanded its sampling of hogs and cattle in the states of Iowa and Nebraska as a result of these findings.

80-1239. Kroes, R. (Author address not given) **Het risico van chemische stoff buiten de industrie. [Risks of nonindustrial chemical substances.]** *Chem. Weekbl.* 70(51-52): 48-50; 1979 (12 references) (Dutch).

The health hazards of non-industrial chemical substances, including food additives and pesticide residues, in soil, water, air, and food are discussed. According to preliminary studies, the average daily intake is found to be 1 μg for hexachlorobenzene and lindane, 6 μg for DDT, 20 μg for PCBs and 7-33 μg for malathion. The acceptable daily intakes (in μg/day) are 36 for hexachlorobenzene, 600 for lindane, 300 for DDT, 150 for PCBs and 1200 for malathion.

80-1240. Fournier, J. C.; Catroux, G. (Lab. Microbiol. Sols, Inst. Natl. Rech. Agron., F-21034 Dijon Cedex, France) **L'Utilisation de souches de micro-organismes de collection pour l'etude de la biodegradabilite des pesticides. [Use of microbial strains from museum collections in the study of pesticide biodegradability.]** *Chemosphere* 9(1): 33-38; 1980 (18 references) (French).

The biodegradability of ^{14}C labeled pesticides [ametryn, atraton, atrazine, simazine, isoproturone, 2,4-D, 2,6-dichlorobenzamide, phenobenzuron, and pyrazone (chloridazon)] by soil suspensions and by different soil microbial strains from museum collections was studied. Degradability by cometabolism was studied by the addition of another carbon source (glucose for most pesticides, sodium benzoate for phenobenzuron). Four different types of soil were tested. The degradation by soil suspensions was best for phenobenzuron and 2,4-D in all soils, and negligible for ametryne and isoproturone. Atraton was not degraded at all. Simazine was degraded only in loamy clay. The microbial strains tested were *Aspergillus flavus, A. fumigalus, Fusarium oxysporum* f. sp. *meloni, F. roseum avenaceum, F. roseum gramineарum, F. solani, Mucor racemosus, Penicillium decumbens, P. janthinellum, P. rugulosum, Rhizoctoria solani, Talaromyces wortmanni, Pseudomonas crucivae, P. putida*, and *P. striata*. Pyrazone and 2,6-dichlorobenzamide were not degraded by any of the strains tested, while simazine was degraded at rates of 50-100% by most strains. Ametryn, atrazine, and 2,4-D were degraded only slightly, if at all. Isoproturone was degraded at rates of 50-100% by *A. fumigalus, R. solani*, and *T. wortmanni*.

80-1241. Anonymous **Dinitroaniline herbicides. Comparative summary.** *Chemosphere* 9(1): 67-69; 1980 (19 references).

A brief review of dinitroaniline herbicides is given. The chemical structures of trifluralin, isopropalin, benfluralin, nitralin and oryzalin are included. Metabolites, the qualitative composition of residues, location in which various metabolites may be found, degradation mechanisms, typical residues found following agricultural usage and persistence are discussed. Biological response data for trifluralin and nitralin are given. Usage trends, mode of action, isotopic syntheses and analytical methodology are also mentioned.

80-1242. Torras Casals, C. (Esc. Agric., Caldas de Montbuy, Barcelona, Spain) **Contribucion al estudio de los efectos del diquat y paraquat sobre la microbiologia del suelo. [Study of the effects of diquat and paraquat on soil microbiology.]** *Ciencias (Madrid)* 43(1): 40-45; 1978 (12 references) (Spanish).

The effects of normal doses of diquat and paraquat on the activity of soil microorganisms were studied in slightly acidic calcareous soil in laboratory tests. The pesticides increased the activity of the ammonifying bacteria and caused a slight increase in the activity of aerobic nitrogen-fixing bacteria. There was a definite in-

crease in the activity of the nitrifying bacteria. The activity of the denitrifying microorganisms decreased slightly.

80-1243. Davies, J. E.; Enos, H. F.; Barquet, A.; Morgade, C.; Danauskas, J. X. (Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL 33101) **Pesticide monitoring studies. The epidemiologic and toxicologic potential of urinary metabolites.** *Dev. Toxicol. Environ. Sci.* 4: 369-378; 1979 (10 references).

Studies were undertaken to determine the potential of using urinary metabolites in pesticide monitoring programs, and preliminary findings are reported. Blood and urine samples were collected from three exposure situations: acute poisoning cases, an occupationally exposed group, and the general population. Blood cholinesterase activities were determined and alkyl phosphate metabolites, phenolic metabolites, and malathion mono- and dicarboxylic acids were determined in the urine. Cases discussed include exposure to parathion, mevinphos, malathion, chlorpyrifos, and pesticide mixtures. The results indicate that urinary alkyl phosphate and phenolic metabolites are sensitive and useful instruments of organophosphate exposure. In the acutely poisoned victim, they are indicative of the duration of the intoxication. The alkyl phosphate metabolites are group specific rather than pesticides specific, making it impossible to predict cholinesterase inhibition illness in the occupationally exposed on the basis of a single urinary alkyl phosphate concentration. It is concluded that these urinary metabolites are reliable epidemiological indicators of organophosphorus exposure and are ideal diagnostic tools in cases of acute pesticide poisoning.

80-1244. Miller, H. J.; Cucos, S.; Wassermann, D.; Wassermann, M. (Dep. Occupat. Health, Hadassah Med. Sch., Hebrew Univ., Jerusalem, Israel) **Organochlorine insecticides and polychlorinated biphenyls in human milk.** *Dev. Toxicol. Environ. Sci.* 4: 379-386; 1979 (7 references).

In order to assess the levels of organochlorine compounds (OCCs) in human milk, milk samples were obtained from 15 women residing in the city of Jerusalem. They were chosen at random, were in months 3-5 of lactation, and had no known occupational exposure to OCCs. The analytical procedures consisted of lipid extraction, purification, and separation of organochlorine insecticides (OCI) from polychlorinated biphenyls (PCBs) by means of column chromatography and gas chromatography. The results obtained were compared with values obtained for colostrum in a previous study. The concentrations of organochlorine pesticides (DDT, lindane, dieldrin, heptachlor epoxide) and PCBs were larger in milk when compared to colostrum (129 versus 72 ppb DDT, 21 versus 10 ppb lindane, 14 versus 7 ppb dieldrin, 14 versus 9 ppb heptachlor epoxide, and 74 versus 44 ppb PCBs, respectively). The increased concentration of OCI compounds in milk compared to colostrum may be explained by a lower residue of OCI in the human body near the end of pregnancy. It was noted that overweight women secreted lower quantities of OCI in milk and colostrum than did women of normal weight.

80-1245. Nassar, A. R.; Ebing, W. (Fac. Agric., Ain-Shams Univ., Cairo, Egypt) **Photodecomposition and volatility of *cis*- and *trans*-diallate.** *Egypt. J. Soil Sci.* 18(2): 137-149; 1979 (6 references).

Soil samples (10 g) fortified with 4 ppm, or 100 μg/ml aqueous solutions of Avadex (*cis*- and *trans*-isomers of di-allate) were irradiated using either UV light or a sun lamp. Volatility of the herbicide was determined at 25 and 35°C. Chromatographic analyses indicated *cis* and *trans* photodecomposition differences depended upon whether they were mixed with a soil sample or were subjected as film. Both isomers were decomposed at a higher rate in the film than in soil material. UV light accelerated decomposition, leading to the appearance of a polar, smaller molecular weight compound. Evaporation of the *cis* isomer was higher than that of *trans*-di-allate; 58.6 and 52.7% of *trans* and *cis*, respectively, remained in treated soil after 32 days. Only 39.8 and 18.1%, respectively, remained in solution after 16 days.

80-1246. Vyberal'sku, Yu.; Mateevska, M. (Inst. Chem. & Storage, Agric. Acad., Szczecin, Poland) **O samoochishchenii vodoemov ot pestitsidov pri razlichnykh temperaturakh. [Self-purification of water bodies from pesticides at different temperatures.]** *Gig. Sanit.* 44(11): 63-65; 1979 (3 references) (Russian).

The effect of water quality and temperature on the self-purification of water from chlorfenvinphos (CV) was studied in drinking water and in 3 different natural surface waters (river, lake, and salt waters) under laboratory conditions in a 120-day experiment (initial concentration not given). The natural waters were characterized by higher dissolved oxygen content and higher BOD_5 values than the drinking water. Regardless of the CV concentration, temperature and water quality had an effect on the half-life of CV: at 5°C, the half-life of CV was 103 days in drinking water, 86 days in lake water, 99 days in river water, and 100 days in salt-water. The differences were more pronounced at 35°C: the half-life was 55 days in drinking water, 50 days in lake water, 41 days in river water, and 40 days in salt-water. Residues were found at 120 days in all waters at both temperatures.

80-1247. Aleshnya, V. V.; Tsatska, A. A. (Rostov Sci. Res. Inst. Epidemiol. Microbiol. & Hyg., Rostov, USSR) **Izmenenie mikroflory vodemov v usloviiakh zagriazneniia**

iadokhimikatomi. [Changes in reservoir microflora in the presence of pesticide contamination.] *Gig. Sanit.* 44(11): 76-77; 1979 (2 references) (Russian).

The effects of DNOC, Ordram (molinate), and trichlorfon on microorganisms in water were studied. In the presence of DNOC (10 mg/l), the *Salmonella derby* count increased during the first 3 days compared with the control, but disappeared by day 20. *Escherichia coli, Streptococcus faecalis,* and *Pseudomonas aeruginosa* were killed in 13 days, at which time these microorganisms were still present in the control. At 1 mg/l, DNOC slightly prolonged the survival of *Salmonella.* At 10 mg/l, trichlorfon stimulated the growth of all microorganisms, especially of *Salmonella* and *E. coli.* In the presence of Ordram (10 mg/l), *S. derby* survived 41 days, versus 20 days in the control. The stimulating effect showed a concentration dependent decrease of 1 and 0.1 mg/l, while the concentration of 0.025 mg/l was ineffective.

80-1248. Wiese, A. F.; Savage, K. E.; Chandler, J. M.; Liu, L. C.; Jeffery, L. S.; Weber, J. B.; LaFleur, K. S. (Texas Agric. Exp. Stn., Bushland, TX 79012) **Loss of fluometuron in runoff water.** *J. Environ. Qual.* 9(1): 1-5; 1980 (29 references).

The amount of fluometuron in runoff water under different environmental conditions was determined in the southern US and Puerto Rico. In Mississippi, Puerto Rico, and Texas, runoff water was collected from soil sprayed with 4.4 kg/ha of fluometuron each year for 3 yr. Tests were conducted in Tennessee for 2 yr and in North and South Carolina for 1 yr. Water samples were collected in 4 by 10 m plots, and 1 m downslope. Initial runoff was produced with sprinkler irrigation immediately after herbicide application at all locations except Tennessee and South Carolina which relied on rainfall. Later in the season, water was sampled from two additional runoff events of either irrigation or rainfall. A total of 32 runoff events were sampled at the 6 locations. The level of fluometuron in water caught 1 m downslope from treated areas during the first runoff averaged 0.30 ppm and was highest (0.87 ppm) in Puerto Rico. Fluometuron concentration in subsequent events was much lower than in the first runoff events. Average loss of fluometuron in 1 cm of runoff was < 1% of applied fluometuron. Only 2% of applied fluometuron was lost in the situation producing the highest concentration in runoff water. Level of fluometuron in runoff water was directly related to slope. Results of this study indicate that fluometuron concentrations in runoff from treated fields are such that nontarget species should not be adversely affected. (Author abstract by permission)

80-1249. Rohde, W. A.; Asmussen, L. E.; Hauser, E. W.; Wauchope, R. D.; Allison, H. D. (Southeast Watershed Res. Prog., SEA, USDA, Tifton, GA) **Trifluralin movement in runoff from a small agricultural watershed.** *J. Environ. Qual.* 9(1): 37-42; 1980 (16 references).

Little trifluralin moved in the surface flow from a small agricultural watershed located in the Southeastern Coastal Plain. Movement of trifluralin in 1974 and 1975 in surface water was 0.17 and 0.03%, respectively, of the total amount applied (1.12 kg/ha). Trifluralin movement in the shallow subsurface flow (above the 214 cm depth) was recorded only in 1974 and was negligible. Trifluralin was detectable in the soil from the 1974 application before the 1975 application. Soil concentration of trifluralin in 1974 was 320 ng/g (immediately after application) in the 0 to 10 cm depth and after 114 days the concentration decreased to 73 ng/g. However, no trifluralin was detected in the 30 to 60 cm depth 60 days after application. Simulated surface runoff from subplots on the watershed produced measurable concentrations of trifluralin 38 days after application, but it could not be detected after 71 days. Trifluralin movement was greater in runoff caused by simulated rainfall than that from natural rainfall due to the high application rate of water (19.1 cm/hr) and the lack of a vegetational buffer. Trifluralin loss in the simulated rainfall runoff water from a small plot directed through a 24.4 cm waterway was reduced 96% under dry and 86% under wet conditions. Hence, trifluralin movement can be significantly reduced and possibly managed by buffer strips or vegetated waterways adjoining cropped areas. Appropriate use of these buffer areas should reduce to acceptable levels the chemical concentration in the runoff before the runoff reaches the surrounding streams. (Author abstract by permission)

80-1250. Peck, D. E.; Corwin, D. L.; Farmer, W. J. (Coop. Ext. Serv., Univ. Nevada, Overton, NV 89040) **Adsorption-desorption of diuron by freshwater sediments.** *J. Environ. Qual.* 9(1): 101-106; 1980 (18 references).

Freshwater sediments were collected from eight different locations in California to study the influence of sediment properties on the adsorption and desorption of the model herbicide, diuron. The sediments were characterized as to physical and chemical properties using the same methods used for soils. The sediments had a range of organic carbon of 0.91 to 19% and were high in silt and clay. The adsorption of diuron was described by the Freundlich equation. Adsorption at 25°C expressed as the Freundlich coefficient, k, was positively correlated to the amount of organic carbon present. There was no correlation with total CEC. The desorption of diuron was evaluated by taking the difference between the slopes of the adsorption and desorption isotherms. As the difference between these slopes increased, less diuron was desorbed. These differences were positively correlated to k and organic carbon. Adsorption at temperatures of 5, 25, and 40°C on three sediments indicated that the adsorption of diuron decreased as the temperature increased. (Author abstract by permission)

80-1251. Wahid, P. A.; Ramakrishna, C.; Sethunathan, N. (Cent. Rice Res. Inst., Cuttack 753006, India) **Instantaneous degradation of parathion in anaerobic soils.** *J. Environ. Qual.* 9(1): 127-130; 1980 (9 references).

In flooded rice (*Oryza sativa* L.) culture, the pesticides are applied to rice fields after several days of submergence when the soil is already in a reduced state. Parathion was, therefore, equilibrated with soils previously reduced by flooding with water and then analyzed by isotope technique or by gas-liquid chromatography. Instantaneous surface catalyzed degradation of parathion occurred when the insecticide was shaken for as little as 5 sec with soils pre-reduced by flooding. Aminoparathion was the major product of this reaction. The interaction of parathion with pre-reduced soil appeared to be mediated by soil enzymes and/or other heat-labile substances produced by soil anaerobiosis. (Author abstract by permission)

80-1252. Muir, D. C. G.; Grift, N. P.; Blouw, A. P.; Lockhart, W. L. (Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada) **Persistence of fluridone in small ponds.** *J. Environ. Qual.* 9(1): 151-156; 1980 (15 references).

Fluridone {1-methyl-3-phenyl-5-[3-(trifluoromethyl) phenyl]-4-[1H]-pyridinone} was applied to three small ponds (5 by 2.5 m^2) to give water concentrations of 5000, 700, and 70 $\mu g/l$, respectively. Water, hydrosoil (0-3 and 3-6 cm depth), duckweed (*Lemna minor*), and minnows (*Pimephales promelas*) were collected for residue analysis over a 70 wk period following herbicide application. The half-life of fluridone in the water column (0.5 m depth) ranged from 4 (at 700 $\mu g/l$) to 7 days (70 $\mu g/l$). Upon treatment of one of the ponds the following year at 100 $\mu g/l$, a half-life of 4 days was observed. Fluridone persisted in hydrosoils with an apparent half-life of 1 yr or more at all treatment levels. Retreatment of one of the ponds resulted in a buildup of herbicide residue which dissipated more rapidly (half-life of 20 wk) than after the first treatment. Bioassays indicated that fluridone residues in hydrosoil from the ponds treated at 700 and 5000 $\mu g/l$, taken 42-70 wk after treatment, were phytotoxic to duckweed. Fluridone levels in minnows were very low (< 0.02 to 0.14 $\mu g/g$) throughout the sampling period with bioconcentration factors ranging from 0 to 64. Fluridone levels in duckweed were proportional to the herbicide concentrations in the pond water with bioconcentration factors ranging from 19 to 85. (Author abstract by permission)

80-1253. Martin, B. B.; Martin, D. F. (Dep. Chem., Univ. South Florida, Tampa, FL 33620) **Rotenone as a causative agent in the mass mortality of white amur in an Orange County, Florida pond.** *J. Environ. Sci. Health A* 14(8): 709-715; 1979 (18 references).

A massive fish kill of white amur (*Ctenopharyngodon idella*) in a holding pond in Orange County, Florida, occurred in March 1979. Water samples were extracted with chloroform and analyzed by high pressure liquid chromatography. The water was found to contain 1.8 ppm rotenone. In additional studies carrier materials were found to degrade during the first 24 hr after application. The degradation of rotenone was slower, and it is predicted to persist for approximately 48 hr. It was also determined that liquid and dust preparations of rotenone have different chromatograms, and that a dust was used in this situation. The origin of the rotenone was not discovered.

80-1254. Umetsu, N.; Kuwano, E.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Nature of N-S bond cleavage of 2,3-dihyro-2,2-dimethyl-7-benzo-furanyl (di-*n*-butylaminosulfenyl) (methyl) carbamate.** *J. Environ. Sci. Health B* 15(1): 1-23; 1980 (5 references).

The cleavage of the N-S bond in DBSC (FMC 35001; dibutylaminosulfenyl carbofuran) in different buffer solutions (0.05 *M* citrate-phosphate, pH 3-5; 0.05 *M* phosphate, pH 7.0; and 0.05 *M* boric acid-borate, pH 9.0) for hydrolysis; in buffer solutions containing sulfhydryl reagents (L-cysteine or reduced glutathione) for thiolysis; and degradation on TLC plates was investigated. In buffer solutions and on TLC plates, N-S cleavage readily occurred to yield carbofuran as the major product, with minor amounts of *bis*-carbofuran-*N,N'*- disulfide and -trisulfide. At pH 3.0, 93% of the DBSC introduced into buffer was converted to carbofuran after 10 min. The rate of conversion decreased with increasing pH; about 33% of the initial DBSC was recovered as carbofuran after 1.5 hr at pH 5.0. Significant amounts of an unknown polar compound were obtained in buffer solutions and on TLC plates. In the presence of sulfhydryl agents, thiolytic N-S bond cleavage proceeded with first order kinetics to give carbofuran as the only identifiable product.

80-1255. Lee, P. W.; Allahyari, R.; Fukuto, T. R. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA) **Absorption and metabolism of the chiral isomers of fonofos in the corn and cotton plant.** *J. Environ. Sci. Health B* 15(1): 25-37; 1980 (7 references).

Ethanol solutions (5 μl) of chiral isomers of phenyl-^{2S}S-fonofos were applied to young corn and cotton plant leaves. Radiolabeled fonofos was also supplied to the plants in 3.2 ppm amounts in solution for 4 days. Root absorption of the $(S)_p$ and $(R)_p$ enantiomers of fonofos by the plants revealed stereoselective differences between the isomers. $(S)_p$-fonofos was absorbed at a faster initial rate and to a greater extent by both plant species than the $(R)_p$ isomer. Nearly 62% of the $(S)_p$-fonofos was absorbed by cotton plants after 12 hr, while only 40% of the $(R)_p$ enantiomer was taken up during this time. Approximately 63 and 25% of the applied $(S)_p$- and $(R)_p$-fonofos, respectively, was taken up by the corn plants during the first 12 hr.

No qualitative or quantitative differences in translocation of the enantiomers were observed. $(S)_p$-fonofos was metabolized to a lesser extent than $(R)_p$-fonofos by both plant species.

80-1256. Chapman, R. A.; Harris, C. R. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Persistence of chlorpyrifos in a mineral and an organic soil.** *J. Environ. Sci. Health B* 15(1): 39-46; 1980 (14 references).

Small plots of Plainfield sand (0.52% organic matter) and muck soil (64.6% organic matter) were dosed with chlorpyrifos (Lorsban EC) at 3.4 kg AI/ha in 455 *l* water/ha. Soil samples were taken at frequent intervals over a 2 yr period to determine persistence of the pesticide. Radishes and carrots, seeded yearly, were used as indicator crops for absorption of insecticide residues. Initial chlorpyrifos residues in sand (2.0 ppm) declined rapidly to 50% of the initial amount applied in 2 wk, and to 5% after 24 wk. In muck soil 50% of the insecticide remained after 8 wk, and only 9% after 1 yr. Pyridinol residues increased to 13 and 39% of the initial chlorpyrifos application, after 1 and 8 wk, respectively. Oxychlorpyrifos was detected in the sand (0.001 ppm) and in muck (0.004 ppm) only in immediate post-treatment samples. In yr 1 of treatment only low levels (< 0.1 ppm) of chlorpyrifos and pyridinol, and no oxychlorpyrifos residues were detected in crops.

80-1257. Mathur, S. P.; Hamilton, H. A.; Vrain, T. C. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario K1A OC6, Canada) **Influence of some field-applied nematicides on microflora and mineral nutrients in an organic soil.** *J. Environ. Sci. Health B* 15(1): 61-76; 1980 (26 references).

The effects of the nematicides Bunema (K N-hydroxymethyl-N-methyldithio- carbamate), Telone II (1,3-D), Temik 10G (aldicarb), Telone C 17 (1,3-D + chloropicrin), Nemacur 15G (fenamiphos), Vydate 10G (oxamyl), Nematak 15G (fosthietan) and Furadan 10G (carbofuran) on the activities of microbial populations in organic soils were investigated. The pesticides were applied at 1.5 and 2× normal doses to plots of carrots heavily infested with *Meloidogyne hapla*, a rootworm of carrots. Bunema increased fungal populations by 144% and bacterial populations significantly 28 days after application. Temik did not cause prolonged or marked changes in populations of soil microorganisms, but Telone II and C17 caused marked increases in fungal, bacterial, and actinomycetal populations 0-28 days after application. Vydate and Furadan both caused particularly significant increases in fungal populations up to 30 days after application. Fungal and bacterial populations were enhanced by Nemacur for 0-9 days, but the numbers of bacteria decreased after 30 days. Plant nutrient levels and soil pH were not affected by the nematicides, except for an increase in NH_4^+ levels after Bunema, Telone II and Telone C17 applications.

80-1258. Nome, F.; Schwingel, E. W.; Ionescu, L. G. (Dep. Quim., Univ. Fed. Santa Catarina, Florianopolis 88000, SC, Brazil) **Micellar effects on the base-catalyzed oxidative cleavage of a carbon-carbon bond in 1,1-bis(*p*-chlorophenol) -2,2,2-trichloroethanol.** *J. Org. Chem.* 45(4): 705-710; 1980 (20 references).

In order to study the decomposition of dicofol, it was oxidized in the presence of four surfactants, CTAB, CHEDAB, NaLS and LCC, and varying hydroxide ion concentrations. Rates of oxidation were determined spectrophotometrically by following the appearance of 4,4,'-dichlorobenzophenone. A catalytic factor of 200 fold was associated with CTAB and of 345 fold for CHEDAB. NaLS inhibited the reaction, but LCC had no effect on the reaction. The authors contend that the catalytic increases were caused by an increase of the concentration of the reagents in the micellar phase.

80-1259. Ahmad, S.; Chaudhry, M. S.; Qureshi, I. H. (Nuclear Chem. Div., Pakistan Inst. Nuclear Sci. & Tech., Rawalpindi, Pakistan) **Determination of toxic elements in tobacco products by instrumental neutron activation analysis.** *J. Radioanal. Chem.* 54(1-2): 331-341; 1979 (24 references).

Cigarette tobacco and tobacco wrapping paper samples were analyzed for concentrations of 15 elements by instrumental neutron activation analysis. About 200 mg samples were irradiated for a period of 10 min to 48 hr at a thermal neutron flux of 2×10^{13} n/cm²/sec in a PINSTECH research reactor PARR I. Counting conditions included measurements with a semi-planar Ge(Li) detector coupled to a charge sensitive preamplifier, Ortec Model 451 spectroscopic amplifier, and a Nuclear Data 4410 computerized multichannel analyzer. The samples were counted for 10-30 min duration and repeated over a period of 2 wk to establish halflife and confirm identification. The concentration of arsenic (As) in tobacco and wrapper paper ranged between 0.25-2.7, and 1.2-2.4 ppm, respectively. Bromine content ranged between 73-137 ppm in different cigarette brands. This large variation is suggested to be due to the use of Br containing agricultural chemicals and pesticides, such as methyl bromide and bromopropylate. Mercury contents in tobacco were relatively small (0.08-0.20 ppm). Other metals identified in cigarette smoke included Se, Sb, Co, Rb, Cr, Zn, Fe, Mn, Sc, Na, and K.

80-1260. Filippov, G. A.; Inshakova, K. P. (Moldavian Sci. Res. Inst. Irrig. Farming & Olericulture, Kishinev, USSR) **Gerbitsidy na posadkakh pertsa i baklazhanov. [Pesticides in green pepper and eggplant cultures.]** *Khim. Sel'sk. Khoz.* 17(10): 38-40; 1979 (6 references) (Russian).

Fields were treated with the herbicide Treflan (trifluralin) at levels of 0.6-2 kg/ha. Treflen was applied to the soil and covered to a depth of 5-8 cm 7-10 days before the planting of green pepper and eggplant cultures. No pesticide residues were found in harvested green peppers and eggplants.

80-1261. Karpova, G. Ya.; Semak, V. I.; Koltypina, S. B.; Yakubovich, A. D. (All-Union Res. Inst. Essential Crops, Krasnodar, USSR) **Dlitel'noe primenenie simazina na plantatsiyakh lavandy. [Prolonged application of simazine in lavender plantations.]** *Khim. Sel'sk. Khoz.* 18(1): 53-57; 1980 (20 references) (Russian).

An attempt was made to evaluate the long-term effects of prolonged applications of simazine on lavender. Plantations were sprayed with simazine (1.5 kg AI/ha annually, every other yr, and every 2 yr. Soil samples were collected, and the herbicide residues, incidence of soil microflora, and biological activities of the soil were determined. Simazine residues could be detected in the soil within 2 yr of application; in lavender plants herbicide residues were detected only after 5 yr of application. Annual applications of simazine decreased the number of soil microflora in yr 2 and 3, while activities of microbiological processes in the soil (ammonification, nitrification, respiration) were inhibited in yr 4 and 5 of application.

80-1262. Dubrawski, R.; Falandysz, J. (Marit. Inst. Gdansk, PL-80 954 Gdansk, Poland) **Chlorinated hydrocarbons in fish-eating birds from the Gdansk Bay, Baltic Sea.** *Mar. Pollut. Bull.* 11(1): 15-18; 1980 (20 references).

Analysis of chlorinated hydrocarbon residues in fish-eating birds wintering in the Gdansk Bay area of the Baltic Sea in 1975-76 were carried out. Specimens were gathered on the beaches or taken from fishing nets during autumn, winter or early spring, and were without signs of tissue decay. Extractable fat and fresh tissue were analyzed by gas chromatography with a ^{63}Ni electron capture detector. Polychlorinated terphenyls (PCT), hexachlorobenzene (HCB), ΣDDT and PCB residues were determined. In extractable fat from great crested grebes, HCB levels ranged from 0.24 to 46 ppm, ΣDDT from 4.6 to 1400 ppm, and PCB from 4.6 to 1200 ppm. Concentrations of ΣDDT and PCB found in the black guillemot, goosander and black-throated diver were somewhat lower than those previously reported by Scandinavian authors. No PCT substances were found in the birds analyzed.

80-1263. Puccetti, G.; Leoni, V. (Inst. Hyg. G. Sanarelli, Univ. Rome, Rome, Italy) **PCB and HCB in the sediments and waters of the Tiber Estuary.** *Mar. Pollut. Bull.* 11(1): 22-25; 1980 (30 references).

Work was carried out in 1976 and 1977 to outline the range of polychlorinated biphenyls (PCBs) and hexachlorobenzene (HCB) pollution in the coastal seawaters of the mouth of the Tiber River. Water samples from depths of 0.5 m were taken at 18 stations, and sediment samples were extracted with a dredge at 4 of the stations. Analysis was by gas chromatography with an electron capture detector. PCBs were found to be present in 85 of the 86 water samples at a mean level of 0.297 ppb in 1976 and 0.135 ppb in 1977. These levels were much higher than those proposed as acceptable for surface waters. PCBs were found in all 4 sediment samples, ranging from 28 to 770 ppb. Water closer to the coast was less polluted with PCBs than distant water, suggesting that Tiber river water may act as a microbiological decontaminating agent. HCB was not found in any sediment samples, and in only 16% of the water samples, with a range of 0.002 to 0.01 ppb. Since HCB has limited application in Italy that would not account for its wide diffusion, it is suggested that a further source of HCB pollution may be its presence, in the form of impurities, in other pesticides.

80-1264. Thirumurthi, S.; Lebrun, P. (Lab. Gen. & Exp. Ecol., Univ. Louvain, Louvain-la-Neuve, Belgium) **Distribution of bioactivity and residues of carbofuran in a grassland.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 43(2Pt1): 589-598; 1978 (24 references).

Carbofuran was applied at 2 kg AI/ha to grassland by broadcasting and sub-surface banding. Vertical and horizontal distribution of the biological activity of carbofuran was observed with a bioassay technique. Lateral movement of the pesticide of up to 20 cm was noted in 48-72 hr. Biological activity was found to be primarily confined to the upper 6 cm of soil from broadcasting and 10 cm from sub-surface banding. Strong upward movement of carbofuran was indicated by accumulation of residues in the upper soil layer. Broadcast applied carbofuran was found to disperse faster than sub-surface applied material due to volatilization and runoff.

80-1265. Kibler, E.; Hurle, K. (Inst. Phytomed., Univ. Hohenheim, Stuttgart, BRD) **Wechselseitige Beeinflussung von Paraquat und Atrazin bei der Sorption an Montmorillonit und Boden. [Reciprocal effects of paraquat and atrazine on their sorption in montmorillonite and soils.]** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 43(2Pt2): 1117-1128; 1978 (8 references) (German).

The effects of paraquat binding in K-montmorillonite and sandy loam soils on the adsorption of atrazine were investigated. In the clay mineral soil paraquat had a strong concentration related effect on atrazine adsorption. In the sandy soil atrazine adsorption was weakly enhanced by increased paraquat concentrations. Paraquat degradation in soils was slow.

80-1266. Zimmerli, B.; Marschall, T.; Marek, B. (Bundesamt Gesundheitswes., Bern, Switzerland) **Orientierende Untersuchung zum Vorkommen von Pentachlorophenol in Humanurin. [Preliminary studies on occurrence of pentachlorophenol in human urine.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 70(4): 443-450; 1979 (26 references) (German).

Urine samples of adults not exposed to PCP and of individuals living in rooms with 1-10 μg PCP (from PCP-treated paneling)/m^3 air were analyzed for PCP content by gas chromatographic analysis following extraction with benzene. The unexposed group exhibited a 13.5 μg/l median PCP level in urine, the exposed group had levels ranging from 30 to 150 μg/l PCP. Twenty workers employed in a lumber processing enterprise and exposed to PCP occupationally exhibited PCP urine levels of between 140 and 1200 μg/l. The presence of PCP in the urine of unexposed individuals is explained by food intake and respiration. Trace quantities of PCP were found in cereals, milk, margarine and packaging materials.

80-1267. Schuepbach, M. R.; Egli, H. (Kantonales Lab. Basel-Stadt, Basel, Switzerland) **Organochlorpestizide und polychlorierte Biphenyle in Muttermilch. [Organochlorine pesticides and polychlorinated biphenyls in human milk.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 70(4): 451-463; 1979 (8 references) (German).

Samples of human milk taken in 1978 from 50 mothers living in Basel, Switzerland, were analyzed by gas chromatography for their organochlorine pesticide and PCB content. The concentrations found, expressed in mg of residue per kg milk fat, were compared with respective levels from a study performed in 1971. Residues of DDT, HCB (hexachlorobenzene), dieldrin, heptachlor epoxide and HCH (BHC) were found to be approximately half as a result of legal limitations imposed on the use of these substances in the intervening period. However, the stress imposed on infants, especially HCB and DDT, is concluded to be great enough to cause physiological effects. PCBs were not determined in 1971, the median level in 1978 was 2 ppm. Swiss and German mothers were found to be more heavily contaminated with PCBs than mothers from southern Europe; DDT levels in milk fat were higher in southern European women.

80-1268. Jain, H. K.; Agnihotri, N. P.; Bhatia, S. K. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Insecticide residues in barley at harvest.** *Pesticides* 12(6): 41-42; 1978 (2 references).

Granular formulations of disulfoton (5%) and phorate (10%) were applied as 1) single doses of 0.5 and 1.0 kg AI/ha, respectively, on barley at sowing time, or 2) at 0.5 kg AI/ha rates at sowing time and 0.5 kg/ha 1 mo later. Pesticide residues in the crop were determined at harvest time by TLC. No detectable levels of disulfoton residues were found in the grain. Phorate residues of 1.5 and 1.0 ppm were found in barley for treatment regimes 1 and 2, respectively. TLC analysis showed that the residues were present primarily as phorate sulfoxide and phorate sulfones.

80-1269. Sivaraj, K.; Venugopals, M. S. (Tamilnadu Agric. Univ., Coimbatore 641 003, India) **Influence of mephosfolan on the rhizosphere microflora of rice grown in different soil types.** *Pesticides* 13(11): 23-26; 1979 (12 references).

Three different types of soils were used to test the effects of the insecticide mephosfolan on the rhizosphere microflora of rice. Mephosfolan was applied at 0.75 or 1.0 kg AI/ha 20 days after transplanting rice seedlings to pots. At 1, 3, 10, 25, 40 and 60 days after treatment, rhizosphere soil samples were collected and populations of fungi, bacteria, actinomyces and *Azotobacter* were enumerated using the standard dilution plate techniques. Mephosfolan treatment increased the bacterial population in Lower Bhavani soil and decreased bacteria in Aduthurai and Coimbatore soils. Actinomycete populations increased in Lower Bhavani and Coimbatore soils and decreased in Aduthurai soil. *Azotobacter* populations significantly increased in Aduthurai and Lower Bhavani soils and decreased in Coimbatore soil. Fungal populations decreased in Aduthurai and Coimbatore soils.

80-1270. Randhawa, K. S.; Sandhu, K. S.; Chahal, V. P. S. (Dep. Veg. Crops Landscaping Floricult., Punjab Agric. Univ., Ludhiana, India) **Effect of different herbicides on rhizesphere *(sic)* soil bacteria, actinomycetes and fungi in chemical weed control studies in onion (*Allium cepa* L.).** *Pesticides* 13(12): 25-28; 1979 (10 references).

Different doses of nitrofen, alachlor, fluchloralin, oxadiazon, propanil, chloroxuron, and linuron, singly and in combination, were applied to sandy loam soils. Rhizosphere soil samples were collected 2 mo after planting of onion bulbs to measure the effects of the pesticides on bacteria, actinomycetes and fungi. Bacterial populations were most affected by 1.2 kg AI/ha propanil (12.5×10^7 bacteria/g soil), 2.0 kg AI/ha chloroxuron (14.6×10^7) and 2.0 kg AI/ha nitrofen (19.3×10^7). Control unweeded soils contained an average of 26.6×10^7 bacteria/g soil. With the exception of fluchloralin at 0.9 AI/ha, all pesticidal treatments significantly reduced ($p < 0.05$) actinomycete populations. The maximum reduction in actinomycetes occurred after 1.02 and 1.36 kg AI/ha propanil applications. Maximum reductions of fungi were caused by propanil at 1.02 and 1.36 kg/ha, and by chloroxuron at 2.0 and 3.0 kg/ha applications.

80-1271. Buckley, J. L. (US EPA, Whitney Point, NY 13862) **Nontarget effects of pesticides in the environment.**

In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 73-81; 1979 (11 references).

A historical review of the introduction and subsequent environmental pollution of DDT is presented. The discovery of the long-term persistence and magnification of the organochlorines, aldrin, DDT and heptachlor, and the toxicity of their degradation products, dieldrin, TDE and DDE, and heptachlor epoxide is traced. The effects of persistent pesticides on non-target game, fish, birds and bees are also discussed. The incident of Kepone (chlordecone) contamination of the Hopewell River is mentioned. The use of alternative controls is examined for possible adverse effects to non-target organisms; chitin synthesis inhibitors and juvenile hormones may adversely effect crustaceans.

80-1272. Adhikari, M.; Mandal, B.; Sen, P. (Coll. Agric., Calcutta Univ., Calcutta, India) **Studies on the interaction of folic acid, 2,4-D, and malathion with natural, synthetic and microbial humic acids.** *Proc. Indian Natl. Sci. Acad. Part A* 45(4): 358-365; 1979 (7 references).

Humic acid precipitated from natural humus, and synthetic and microbial humic acids were immersed in 200 ppm solutions of 2,4-D (Na salt), 0.1% solution of folic acid, and 150 ppm technical grade malathion. Potentiometric titrations of the different humic acids and of their complexes with the pesticides were carried out; IR spectroscopy was employed for dry samples. Binding sites in humic acids are considered to be -COOH, -OH, -C=O, -NH, and $-NH_2$ groups. The relative interacting powers of the different humic acids were found to be synthetic > microbial > natural. In most cases H-bonding was responsible for formation of the complexes. Synthetic and microbial humic acids possess simpler and more exposed structures, and are more capable of forming linkages than natural humic acids.

80-1273. Schiavon, M.; Jacquin, F.; Goussault, C. (Ecole Natl. Super. Agron. & Ind. Aliment., Nancy, France) **Blocage de molecules *S*-triaziniques par la matiere organique. [Blocking *S*-triazine molecules by organic matter.]** *Proc. Symp. Soil Org. Matter Stud.* 2: 327-332; 1978 (19 references) (French).

The role organic soil matter plays in degrading atrazine was studied by extraction of the ^{14}C-labeled product in the soil with methanol and water. After 31 days of incubation 30-40% of the amounts originally applied were removed by a degradation process attributed to fulvic acids and humics. Strong adsorption of *S*-triazinic molecules by fulvic acids is in accord with the carboxylic and phenolic groups. Humic acids also form stable bonds with *S*-triazine. The latter process proceeds with greater intensity and contributes primarily to the desorption of *S*-triazinic molecules.

80-1274. Fuehr, F.; Mittelstaedt, W.; Haider, K. (Arbeitsgruppe Radioagron., Kernforschungsanlage Juelich GmbH, Juelich, BRD) **Bound or adsorbed methabenzthiazuron residues in soil.** *Proc. Symp. Soil Org. Matter Stud.* 2: 333-337; 1978 (15 references).

Sandy soil (200 g) was incubated with 10 ppm methabenzthiazuron for a 98 day period. A two-step extraction procedure was used to remove 93% of the methabenzthiazuron residue from the soil. More than 94% of the extracted residue was unchanged methabenzthiazuron. When ^{14}C labeled methabenzthiazuron was incubated with two humic acid-like melanin-producing soil fungi, the melanins were found to contain only small amounts of radioactivity. It is concluded that methabenzthiazuron and its residues are strongly absorbed by humic compounds, and only a small fraction is incorporated into organic matter in the soil.

80-1275. Wahid, P. A. (Cent. Rice Res. Inst., Cuttack 753006, India) **Iron reducing capacity as an indicator of parathion degrading ability of submerged soils.** *Prog. Water Technol.* 11(6): 89-94; 1979 (13 references).

An alluvial soil and an acid-sulfate saline soil were used in tests designed to determine whether iron reduction can serve as an index of parathion degrading activity in flooded soils. Soil samples were placed in test tubes and pre-reduced by flooding them and allowing them to stand undisturbed for a period of time; 0.1 ml of parathion (175 ppm) in acetone was then added. After equilibration the parathion residues were quantitatively extracted and analyzed by gas liquid chromatography with flame photometric detector. Ferrous iron in reduced soils or Fe^{2+} formed after the addition of $FeCl_3$ was determined by the *o*-phenanthroline method after extraction with sodium acetate, with color being read at 510 nm in a spectrometer. The reducing capacity due to inorganic reductant, the total reducing capacity, and the potential iron reducing capacity were determined. Of these, the potential iron reducing capacity of soil (the amount of Fe^{2+} formed from $FeCl_3$) was found to correlate best with the instantaneous degradation of parathion. It is suggested that this parameter may be useful in predicting the persistence and the capacity of the soil to degrade parathion under anaerobic conditions.

80-1276. Odeyemi, O. (Dep. Microbiol., Univ. Ife, Ile-Ife, Nigeria) **Persistence of Arasan (pesticide) in aquatic ecosystems in Nigeria.** *Prog. Water Technol.* 11(6): 95-102; 1979 (9 references).

The pollution effects of the thiocarbamate fungicide tetramethylthiuram disulfide (Arasan; thiram) were studied under tropical conditions. Sterilized and unsterilized samples of sewage, fresh water, sea water and agricultural soil collected in Nigeria were incubated with 50 or 100 μg Arasan per ml or per g. At various intervals, samples were analyzed for Arasan by a colorimetric

method. Results indicated that Arasan disappeared in the sewage and freshwater samples within 12 days of incubation, but did not disappear in soil samples until after 40 days. After 8 mo, 20% of the Arasan was still present in sea water. In soil samples, the disappearance of Arasan was faster in unsterilized than in sterilized soil, suggesting microbial involvement in Arasan degradation in soils. In contrast, in sewage and freshwater, microorganisms seem to play no significant role. The results are discussed in terms of potential public health hazards due to agricultural practices in Nigeria.

80-1277. Siddaramappa, R.; Seiber, J. N. (Dep. Soil Microbiol., Int. Rice Res. Inst., Manila, Phillippines) **Persistence of carbofuran in flooded rice soils and water.** *Prog. Water Technol.* 11(6): 103-111; 1979 (14 references).

The persistence of carbofuran residues in various water and soil samples collected from different rice growing areas in the Philippines was evaluated. Aliquots (5 ml) of irrigation or paddy water were added to 5 ml of (approximately 20 ppm) carbofuran dissolved in distilled water. After extraction with methylene chloride, the carbofuran content in samples was determined by gas liquid chromatography. In similar tests, flooded soil samples were incubated with 20 ppm carbofuran in distilled water. Tests were also performed using autoclaved samples to test the role of soil microorganisms. Rapid degradation of carbofuran occurred in two of the three water samples: the low pH of the third sample was apparently responsible for the lack of degradation. Almost identical rates of degradation occurred in both unsterilized and sterilized water samples, suggesting chemical breakdown. In soil samples, autoclaving retarded the degradation process, which suggests microbial degradation. Root zone placement increased the persistence of carbofuran significantly compared to application in paddy water. The duration of carbofuran activity in soil and paddy water was influenced by the addition of various nitrogenous fertilizers such as ammonium nitrate or urea. The results are discussed in terms of the effect on fish culture in rice paddies.

80-1278. Sudhakar-Barik; Sethunathan, N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Persistence of parathion increased by benomyl in flooded soil.** *Prog. Water Technol.* 11(6): 113-119; 1979 (11 references).

The effects of simultaneous or successive applications of more than one pesticide on pesticide persistence were investigated. Flooded alluvial soils was treated with 200 ppm 2,4-D, atrazine, HCH (BHC), or benomyl and incubated for 10 days. Aqueous parathion solution was added (1 ml of 500 or 1000 ppm) and nitro group reduction to aminoparathion or parathion hydrolysis was followed. Parathion reduction occurred rapidly in the presence of atrazine, 2,4-D or HCH; no appreciable conversion occurred in the presence of benomyl. In parathion hydrolysis studies, almost all parathion disappeared from the soil within 5 days after inoculation with 2,4-D or atrazine, singly or in combination. After 15 days, parathion levels were low in soils treated with HCH. The presence of benomyl inhibited parathion hydrolysis; > 50% parathion was recovered after 15 days. Long term persistence of parathion can occur in the presence of other pesticides, such as benomyl, thus increasing the contamination of water resources.

80-1279. Loehr, R. C. (Environ. Stud. Program, Cornell Univ., Ithaca, NY 14853) **Potential pollutants from agriculture - an assessment of the problem and possible control approaches.** *Prog. Water Technol.* 11(6): 169-193; 1979 (19 references).

A review of the nature of potential water pollution contributions from agriculture, the magnitude of discharges, and potential control approaches and practices is presented and both point and non-point sources are discussed. The major sources of potential pollutants from agriculture are feedlots and barnyards, manure spread land, and cropland erosion. Paraquat, diquat and DDT are strongly adsorbed to soil particles and are lost with sediment runoff. Pesticides are considered to be minor problems from animal production and food processing sources. Pesticides are more likely to be potential water pollutants from irrigated and non-irrigated crop production fields.

80-1280. Nasar, S. A. K. (Dep. Zool., Sch. Life Sci., North Eastern Hill Univ., Shillong 793003, India) **Effect of certain organochlor *(sic)* insecticides on primary production in a freshwater pond.** *Prog. Water Technol.* 11(6): 247-251; 1979 (23 references).

The effects of the organochlorine insecticides aldrin, dieldrin, and endrin on the primary productivity of phytoplankton were studied. Light and dark bottles containing 0.01, 0.1, 0.5, 1.0 or 1.5 ppm insecticide were used to estimate primary production in g C/m^3/day. Phytoplankton primary production was retarded by 37.9%, 25.0% and 14.8% at 0.5 ppm, 0.01 ppm, and 1.0 ppm, aldrin, dieldrin, and endrin, respectively. Primary production was found to be ≈ 0 at levels of 1.0 ppm, 0.1 ppm and 1.5 ppm for aldrin, dieldrin and endrin, respectively. The results indicate that the insecticides lower the rate of primary productivity, probably by inhibiting photosynthesis.

80-1281. Kearney, P. C. (Author address not given) **Nitrosamines and pesticides. A special report on the occurrence of nitrosamines as terminal residues resulting from agricultural use of certain pesticides.** *Pure Appl. Chem.* 52(2): 501-526; 1980 (160 references).

The chemistry, determination methods, formation, degradation and metabolism, and risk assessment procedures for nitrosamines associated with pesticides are reviewed. The presence of nitrosamine contaminants has been established in dinitroaniline and some acid herbicides. With the dinitroanilines such contaminants arise during chemical synthesis. In the case of certain halobenzoic acid formulations, these contaminants appear in the product due to nitrite. Current methods for detecting these contaminants are discussed. The formation of nitrosated pesticides in soil or water is discussed, and is concluded not to be a problem of great concern. *In vivo* studies on the nitrosation of pesticides and dialkylamines are presented. Tumor formation has resulted from the concurrent administration of certain amines and nitrite to laboratory animals. The fate of nitrosamines in the environment is also considered. It is noted that nitrosamines are photolabile and the volatile members of the group are partially dissipated by volatilization and subsequent photodecomposition in the air. Most nitrosamines are stable to hydrolysis in aqueous solutions at the pH normally found in surface and ground waters. They are photodecomposed in solutions. No nitrosated products have been identified in plants or grain of crops treated with ^{14}C labeled nitroso compounds.

80-1282. Goldberg, E. D. (Scripps Inst. Oceanogr., La Jolla, CA) **Action and reaction times in global marine pollution problems.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 471-478; 1975 (9 references).

A general review of marine pollution by land-origin contaminants is presented. Past results of pollutants released into the environment, such as mercury to coastal waters, or the unlimited use of chemicals, such as DDT, are still being monitored to determine lasting adverse effects. To assess environmental impact of possible ocean contaminants, critical parameters, such as toxicity, persistence, and production/use data, have been established to determine potential marine pollutants. Additionally concentration factors in various reservoirs, and time factors relating oceanic and societal time scales can be used. The atmospheric residence times of PCB and DDT, 40 and 51 days respectively, are related to the atmospheric transport of these chemicals to surface seawaters and their persistence there. DDT, dieldrin, aldrin, hexachlorobenzene and PCB effects on marine eggshells illustrate the need to determine synergistic or antagonistic effects in addition to short term toxicity tests.

80-1283. Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI) **Movements of pesticidal residues in the environment.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press: Oxford): pp. 528-531; 1975 (12 references).

Three major routes of pesticide transport within biological systems are discussed. These routes are: from the soil through terrestrial plants and into herbivorous animals; from the soil to soil invertebrates and then to vertebrates and carnivorous animals; and from the soil to the aquatic environment, through plankton, fish and aquatic animals, and into fish eating animals. Dieldrin and DDT studies are used as examples to show that the rate of bioaccumulation in the aquatic environments is much higher than in any other type of ecosystem. The lack of significant residue accumulation in large herbivorous animals is noteworthy. It is stressed that the levels of pesticides in any biological system are the result of the active processes of uptake and loss. The rates of these processes are determined by the amounts of pesticide available, and by the fat content and metabolic state of the animals.

80-1284. Korte, F. (Inst. Chem. Weihenstephan, Tech. Univ. Muenchen, Munich, BRD) **Ecotoxicology of polychlorinated organic compounds.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 531-540; 1975.

The toxicity of polychlorinated organic compounds to the environment is reviewed. Consideration is given to the influence of these chemicals, especially aldrin, dieldrin, endrin, photodieldrin, photoaldrin, heptachlor epoxide and hydroxychlordane, on wildlife. The concept of the indicator organism is discussed. Analytical means of detecting changes in the concentration of chemicals in the media or organisms in the environment are also presented. Many of the experiments reviewed in this paper demonstrate that a majority of the chemicals used in the environment evaporate into the atmosphere which may be a sink for these chemicals. It is demonstrated that there are mechanisms in the environment for the mineralization of possibly all organic chemicals. However, the significance of mineralization in the long-term balance of the fate of these chemicals in the environment has yet to be determined.

80-1285. Landa, E. R. (Dep. Soil Sci., Oregon State Univ., Corvallis, OR 97331) **The volatile loss of mercury from soils amended with methylmercury chloride.** *Soil Sci.* 128(1): 9-16; 1979 (28 references).

Five surface soils from southeastern Montana were treated with ^{203}Hg labeled methylmercury chloride to achieve final concentrations of 1.0 μg/g soil. Hg content was monitored for 2 mo by gamma spectrometry. Hg losses

were found to increase with soil temperature over the 16-35°C range examined. Supplementation of soils with glucose and nitrate repressed Hg loss. Volatilization of Hg was also retarded at very low (air dry) and very high (80% saturation) moisture contents. Hg losses were found to be highest from strongly alkaline soils.

80-1286. Han, J. C. Y.; Krause, R. L. (Biochem. Dep., Exp. Stn., EI DuPont de Nemours & Co. Inc., Wilmington, DE 19898) **Microbial activity in soils treated with fosamine ammonium.** *Soil Sci.* 128(1): 23-27; 1979 (4 references).

The plant growth regulator fosamine ammonium was incorporated into 2 agricultural soils (Fallsington sandy loam and Keyport silt loam) at concentrations of 0.5, 5 and 20 ppm and observed for 5 wk. No effect on soil nitrification was noted. Fosamine ammonium was applied to 3 agricultural soils (Immokalee fine sand, Fallsington sandy loam and Flanagan silt loam) at 10 ppm and observed for an 8 wk period. Soil bacteria and fungi populations were found to be unchanged. The plant growth regulator also showed low fungitoxicity in bioassay tests at treatment levels of up to 100 ppm.

80-1287. LaFleur, K. S. (Dep. Agron. & Soils, Clemson Univ., Clemson, SC 29631) **Metribuzin movement in soil columns: observation and prediction.** *Soil Sci.* 129(2): 107-114; 1980 (17 references).

Norfolk loamy sand and Cecil sandy loam were treated with 2.15 mg metribuzin/kg. Water was added to the experimental columns of soil in amounts similar to rainfall expected to South Carolina. During the study metribuzin was distributed in the column in the form of Guassian curves. After passage of the equivalent of 8 mo rainfall, metribuzin had moved completely through the columns and resided in the effluent. It is suggested that such studies can be used to approximate the distribution of any intact pesticide in any soil at any time after its application. Adjustments will be needed based on pesticide decomposition rates.

80-1288. Sanchez Camazano, M.; Sanchez Martin, M. (Cent. Edafol. & Biol. Apl., Cons. Super. Invest. Cient., Salamanca, Spain) **Interaction of phosmet with montmorillonite.** *Soil Sci.* 129(2): 115-118; 1980 (17 references).

X-ray diffraction studies of Ca-montmorillonite treated with a 0.3 *M* solution of phosmet in 1,2-dichloroethane showed that the insecticide penetrated into the interlayer space of the silicate, forming a complex of 16.05 angstrom basal spacing. The spacing is affected by the nature of the interlayer cations. The shifts of the P to S bond and the C to O bond stretching frequencies in the infrared spectra, as a function of the interlayer cation and hydration status of the complexes, indicate that phosmet molecules interact with the interlayer cations through both the oxygen atom of the C=O group and the sulfur atom of the P=S group. It is concluded that the complex is monolayer. Possible orientation of the organic molecules within the interlayer space is discussed.

80-1289. Zimmerli, B. (Author address not given) **Modellversuche zum Uebergang von Schadstoffen aus Anstrichen in die Luft. [Model experiments to study the transfer of toxic substances from paint coats into the air.]** *Staub Reinhalt. Luft* 40(1): 30-34; 1980 (17 references) (German).

Model experiments to study 2 parameters determining the transfer of chemicals from paint coats into the room atmosphere (the equilibrium concentration of the chemical in the air and the resistance to mass transfer caused by the paint film) are described. The system consists of a convection-free device of constant cross-section in which a chemical emitting surface and an absorbing (adsorbing) surface are placed opposite each other at a given distance. An equation is presented for determining the amount of the chemical adsorbed or absorbed per unit of time and surface at steady state. Diffusion tests were performed to determine the saturation concentrations of dieldrin, pentachlorophenol (PCP), lindane, diazinon, α-endosulfan and 2,3,7,8-tetrachlorodibenzo- *p*-dioxin.

80-1290. Kavalenka, N. A.; Misnik, A. G.; Filipshanava, L. I.; Apanasenka, G. A. (Inst. Microbiol., Belorussian SSR Acad. Sci., Minsk, USSR) **Uplyu prametrynu i 2M-4Kh na dykhanie i nitryfikuyfikuyuchuyu zdol 'nats' tarfyana-balotnai gleby. [Effect of prometryn and MCPA on the respiration and nitrification capacity of peat-bog soil.]** *Vestsi Akad. Navuk B. SSR Ser. Biyal. Navuk* (3): 78-80; 1979 (10 references) (Belorussian).

The effects of prometryne and MCPA (3-243 mg/kg for both) on respiration (CO_2 production) and nitrification (NO_3 production) capacity of peat-bog soil were studied. The duration of the incubation was 5-30 days in the study of the respiration capacity and 7-35 days in the nitrification study. The herbicides had no noticeable effect on soil respiration and caused only slight decrease in the nitrification capacity during the first 2 wk of incubation.

80-1291. Kacmar, P.; Samo, A.; Blochova, O. (Univ. Vet. Med., Kosice, Czechoslovakia) **Rezidua niektorych chlorovanych pesticidov u volne zijucich zvierat a ryb. [Residues of some chlorinated pesticides in wildlife and fish.]** *Vet. Med. (Prague)* 23(12): 737-745; 1978 (16 references) (Slovak).

Residues of total DDT (*p,p'*-DDT, *o,p'*-DDT,

p,p'-TDE and *p,p'*-DDE) and total HCH (α, β, δ-BHC and lindane) in tissues and organs of rabbits, pheasants and fish from different regions of Slovakia were determined by gas chromatography. The levels varied with habitat locations; DDT and HCH residues were markedly higher in animals captured in lowland regions. Total DDT levels ranged from 4.7×10^{-3} ppm in pheasant liver to 5.6×10^{-1} ppm in carp liver. Total HCH levels ranged from 0.01 ppm in pheasant liver to 3×10^{-1} ppm in rabbit liver. The persistence and biotransformation of the compounds are also discussed.

80-1292. Gajduskova, V.; Matyas, Z. (Vet. Res. Inst., Brno, Czechoslovakia) **Rezidua pesticidu ve sladkovodnich rybach. [Pesticide residues in freshwater fish.]** *Vet. Med. (Prague)* 24(2): 115-120; 1979 (11 references) (Czech).

Pesticide residues in pond water and in carp were determined. With the exception of γ-HCH (lindane) only trace amounts of chlorinated pesticides were found in water. No organophosphate residues were detected in any of the water samples. The maximum levels of pesticides in carp muscle were: HCB (hexachlorobenzene) 0.434 mg/kg (mean 0.172 mg/kg), α-HCH (α-BHC) 0.44 mg/kg (0.16), γ-HCH 0.434 mg/kg (0.155), DDE 0.357 mg/kg, and ΣDDT 1.66 mg/kg (0.383). Comparisons of tolerances for HCB and γ-HCH in meat, and for DDT in fish indicated that the pesticide residues found in carp did not exceed acceptable tolerance levels.

80-1293. Herzel, F.; Schmidt, G. (Inst. Wasser-Boden & Lufthyg., Bundesgesundheitsamt, Berlin, BRD) **Pruefung des Versickerungslverhaltens von Pflanzenschutzmitteln an Lysimetern und Kleinsaeulen. [Testing the leaching behavior of herbicides on lysimeters and small columns.]** *WaBoLu-Ber.* (3): 16 pp.; 1979 (9 references) (German).

The leaching behavior of atrazine, 2,4-D, dalapon, monolinuron, buturon, DNOC, MCPA, dichlobenil and 2,6-dichlorobenzamide was investigated on lysimeters with and without organic top soil, and compared with parallel determinations performed in small columns. Comparison is feasible only if the soil layers in both experimental arrangements are identical; in this case both the lysimeters and columns were filled with sand. Comparison of the irrigation volume per unit of surface for a single passage through soil yielded satisfactory correlation of the migratory behavior of the respective substances in the two setups. Even after 18 mo of watering the lysimeters (with volumes of water corresponding to median precipitation) residues of the stable active agents and their metabolites were still detectable.

80-1294. Schmidt, H.; Beitz, H. (Akad. Landwirtschaft-swiss. DDR, DDR-108 Berlin, DDR) **Die Bodenkontamination durch Pflanzenschutzmittel und moegliche Gefahren fuer ihr Eindringen in das Grundwasser. [Soil contamination by pesticides and possible risks of their penetration into the groundwater.]** *Wasserwirtsch. Wassertech.* 29(11): 366-368; 1979 (10 references) (German).

The risks of groundwater contamination as a consequence of soil contamination by pesticides are discussed, and a field study is described. The leachout and spread of a pesticide (dichlorprop) was studied by discharging 900 ℓ of spray liquid on the soil and determining the dichlorprop residues in groundwater samples. Samples were taken on 7 consecutive days from 8 wells drilled up to 10 m from the source to depths over 2.5 m, along a line parallel to the direction of the groundwater flow. The dichlorprop concentration found in the groundwater at 2 m was 7.0 μg/l on day 1, highest on day 4 (10.5 μg/l), and only 1.9 μg/l on day 7. Residues were found at the greatest distance (10 m) on day 4 only. On day 7, the residue level found at 6 m was 1.1 μg/l, but no residue was detected at 8 m.

80-1295. Yamato, Y.; Suzuki, M.; Shimohara, K.; Akiyama, T. (Kitakyushu Munic. Inst. Environ. Health Sci., Tobata-ku, Kitakyushu 804, Japan) **Behaviour of HCH (1,2,3,4,5,6-hexachlorocyclohexane) residue in the aquatic environment.** *Water Res.* 14(3): 247-251; 1980 (16 references).

Seasonal variations in concentrations of HCH (BHC) residues in surface waters of the Onga River and a reservoir were investigated. The logarithms of monthly HCH concentrations plotted against time were described as waves for each of 5 sampling sites. The waves indicated that maximum concentrations of ΣHCH residues occurred during the summer months (0.2-0.5 ppb during May 1972), and were least during the winter season (0.09-0.105 ppb in Jan. 1973). These maxima decreased each year during the study. Maximum concentrations of 0.10-0.2 ppb ΣHCH were found in May 1976; winter 1976 concentrations dropped to 0.08-0.09 ppb. The slope of the wave at the downstream sampling site was lower than the upper stream sites. Maximum concentrations of ΣHCH residues at each sampling site were predicted to be about 10^{-3} to 10^{-2} that of the downstream area by 1985. It is estimated that β-HCH (β-BHC), a persistent isomer of HCH, will represent about 60% of the total HCH in 1985.

80-1296. Singh, S. P.; Mueller, F. (Isotop. Lab., Inst. Phytomed., Univ. Hohenheim, Stuttgart Hohenheim, BRD) **Translocation of 2,4-D, asulam and amitrole in water hyacinth.** *Weed Res.* 19(3): 171-183; 1979 (16 references).

In glasshouse experiments foliar application of ^{14}C-labeled herbicides to water hyacinth plants at the 4-leaf stage indicated that amitrole transport from the treated leaf blade was faster and greater than 2,4-D, but a little less

than asulam. From treated leaves 14.2, 25.9, 28.7, 44.5 and 51.8% of the recovered ^{14}C amitrole was translocated at intervals of 6 hr, and 1, 3, 6 and 12 days, respectively. Both xylem and phloem transport of asulam and amitrole was evident, whereas 2,4-D moved only from source to sink. Movement of the herbicides from the mother to the connected daughter plant or vice versa was dependent upon the size of the latter. Maximum transport of these herbicides in either direction took place at the 2-leaf stage of daughter plants. With any increase or decrease in the number of leaves on daughter plants, the transport of herbicides was reduced. As an exception, daughter plant to mother plant movement of amitrole was maximum at the 1-leaf stage. After extraction, fractionation and TLC separation of foliage-applied ^{14}C-2,4-D, 76.4 and 72.1% of the radioactivity was detected in the chloroform phase of the leaf extract at 3 and 6 day intervals, respectively. In another pot culture experiment, it was observed that after spraying the mother plants with 3,4-D amine at 0.75 kg/ha the connected daughter plants at 1 to 4 leaf stages were killed if the culture solution was contaminated while spraying, or by dying leaves. When contamination was totally avoided, the connected but unsprayed daughter plants at 3 to 4 leaf stages survived. (Author abstract by permission)

80-1297. White, D. H.; Stendell, R. C.; Mulhern, B. M. (Gulf Coast Field Stn., Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Victoria, TX 77901) **Relations of wintering canvasbacks to environmental pollutants - Chesapeake Bay, Maryland.** *Wilson Bull.* 91(2): 279-287; 1979 (29 references).

Canvasback carcasses were collected from the Chesapeake Bay area during the winters of 1973, 1975 and 1976 and examined for chemical contaminants. Of the carcasses examined in 1973, 83% contained DDE, 62% contained PCBs and 24% contained dieldrin. In 1975 the same contaminants were present in 99%, 99% and 14%, respectively. Overall, the DDE residues in canvasback carcasses were low. Dieldrin residues averaged less than 0.2 ppm. PCB's levels were relatively low when compared to levels of these contaminants in other species. Toxaphene, chlordane isomers, hexachlorobenzene and heptachlor epoxide were detected in a few 1975 samples, but in all cases the residues were less than 0.3 ppm and are below levels suspected of causing difficulties in avian species.

80-1298. Schrader, G.; Ladisch, H.; Achtzehn, M. K.; Grahneis, H.; Horn, H. (Inst. Allg. Hyg., Med. Akad. Erfurt, DDR-50 Erfurt, DDR) **Ueber den Nachweis von Dichlordiphenyltrichloraethan (DDT) und polychlorierten Biphenylen (PCB) in der Fauna der Antarktis. [Detection of DDT and PCBs in Antarctic fauna.]** *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(3): 239-241; 1979 (22 references) (German).

Residues of DDT, DDE, DDD (TDE) and PCBs were determined in various organs (liver, fins, heart) of fish, mussels, penguins, albatrosses and sea-gulls caught and in plant materials collected in the Antarctic region during the period from November 1974 to March 1976. The residue levels found in the plant material were 0.5 ppm for DDT and 0.2 ppm for DDE. In the animal samples, the residue levels were 0.7-1.46 ppm for DDT, undetectable to 0.83 ppm for DDE, undetectable to 0.28 ppm for DDD, and undetectable to 1.77 for PCBs. The limits of detection were 0.01-0.05 ppm.

80-1299. Schulze, H. D. (Abt. Allg. & Kommunalhyg., Med. Akad. Magdeburg, DDR-301 Magdeburg, DDR) **Aktuelle Probleme der Schaedlingsbekaempfung im Krankenhaus mit Dichlorvos. [Current problems of pest control in hospitals with dichlorvos.]** *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(5): 421-425; 1979 (37 references) (German).

Residual concentrations of dichlorvos in the air were measured in hospital rooms at various dates after treatment. Dichlorvos was applied at rates of 0.4-1.6 ml/m^3. Residual concentrations of 0.06-0.08 mg/m^3 were found (versus a tolerance level of 0.02 mg/m^3 for 24 hr exposure) despite compliance with all relevant precautionary measures. The highest concentration of 3.7 mg/m^3 was measured 3 hr after application of dichlorvos at a rate of 1.6 ml/m^3 at 30°C and high relative humidity. Levels of 0.10-0.33 mg/m^3 were measured 66-90 hr after application of dichlorvos at a rate of 0.4 ml/m^3 and immediately after ventilation for 2 hr.

See also 80-1215, 80-1304, 80-1307, 80-1314, 80-1320, 80-1321, 80-1340, 80-1357, 80-1369, 80-1375, 80-1387, 80-1481, 80-1482 *and* 80-1488.

80-1300. Anonymous **Poisoning deaths in the United States in 1977.** *Bull. Natl. Clgh. Poison Control Cent.* 24(2): 2-7; 1980.

Mortality data for the year 1977 show a continuing decline of deaths from accidental poisoning for both children and adults. Among non-death solid and liquid substances, pesticides/fertilizers accounted for 31 fatalities in children under 5 in 1968, while only 7 pesticide-related deaths occurred in 1977. There were increases in 1975 (30 deaths) and 1976 (31 deaths). The total number of deaths in all age groups from pesticide/fertilizer poisonings fell from 72 in 1968, to 34 in 1977.

80-1301. Somers, E. (Environ. Health Dir., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario K1A OL2, Canada) **Risk assessment for environmental health.** *Can. J. Public Health* 70(6): 388-392; 1979 (26 references).

The application of basic Canadian federal legislation designed to control environmental hazards generated by both chemical and physical agents is discussed. The derivation of the federal government's authority in this area is reviewed. Recent examples of contaminants entering the environment are listed as are governmental activities concerned with monitoring and regulating such contamination to illustrate the quantitative basis of risk assessment analysis. Contaminants mentioned include PCBs, asbestos, radiation levels, nitrilotriacetic acid, mirex and chloroform.

80-1302. Deichmann, W. B.; MacDonald, W. E. (Res. & Teach. Cent. Toxicol., Sch. Med., Univ. Miami, Coral Gables, FL 33124) **Organochlorine pesticides and liver cancer deaths in the United States, 1930-1972.** *Dev. Toxicol. Environ. Sci.* 4: 147-173; 1979 (50 references).

Toxicity and carcinogenicity epidemiology studies on organochlorine pesticides, particularly DDT, aldrin and dieldrin, are presented. Data on occupational exposure to DDT, to aldrin, to dieldrin, and to a mixture of pesticides, are presented in tabular form. There is evidence that extensive occupational exposure to these compounds can affect certain liver functions, such as stimulation of hepatic drug or steroid metabolism. In addition, exposure to combinations of pesticides has been related to hypertension, elevated serum cholesterol, abnormal EEGs, and impairment of neuromuscular function. Among US and western Europe organochlorine pesticide workers no pesticide-related adverse effects or loss of working time have been noted. Data on non-occupational exposure to various pesticides are also presented. Liver cancer death rates in the continental United States from 1930-1970 are summarized, and a gradual decrease is noted. The total rate of liver cancer death decreased from 8.4 (per 100,000) in 1944, when DDT was introduced, to 5.6 in 1972.

80-1303. Davis, J. H.; Rydland, E. (Off. Med. Exam., Miami, FL 33136) **The changing profile of fatal poisonings. An additional 1676 cases.** *Dev. Toxicol. Environ. Sci.* 4: 415-421; 1979 (4 references).

Data from fatal poisonings in Dade County, Fl, were analyzed and compared with figures from the decade 1956-66 (1004 poisonings) with those from 1966-76 (1976 poisonings). There was an increase from the first decade to the second in drug poisoning, from 58.8% of the total to 83.8%. Fatal pesticide poisonings decreased from 9.7% of the total in 1956-66 to 3.0% of the total in 1966-76. When only accidental poisonings (as opposed to suicides and homicides) were considered, pesticides represented 11.8% of the total in 1956-66, and 2.5% in 1966-76. However, among children under 5 yr, 49.0% of the total accidental poisonings were attributed to pesticides in the first decade, and 18.8% in the second decade. It is suggested that the decrease in deaths from pesticides is partially due to the Community Pesticide Study project in this area. In addition, a physician awareness program resulted in more successful treatments of acute organophosphate poisoning and fewer deaths from such agents.

80-1304. Ramaswamy, S. S. (Cent. Labour Inst., Bombay, India) **Relevance of bio-chemical parameters as indicators of toxic effects in workers exposed to toxic chemicals.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 166-177; 1977 (7 references).

Some problems encountered in using biochemical parameters to evaluate parathion exposure are considered. The parameters used for this evaluation are usually changes in cholinesterase activity levels in the blood, and *p*-nitrophenol excretion in the urine. Considerable individual variations have been shown to exist even though the averages of the group may show a trend of association of these parameters with degree of exposure. It is questioned whether the differences measured are due to differences in personal exposures resulting from individual differences in physical exertion or to lack of standardization in the collection of the samples. It is suggested that the differences in cholinesterase values may be partly due to uncontrolled temperature conditions.

80-1305. Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Toxicology of pesticides: revised estimates.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 564-577; 1977.

The India Insecticides Act of 1968 calls for the evaluation of toxic hazards of pesticides by the manufacturer and provides directions for the safe handling and use of these chemicals. The act requires rigorous and extensive toxicity testing for new compounds to be performed on at least two mammals. The studies required include acute toxicity testing for oral, dermal, inhalation and eye and skin irritation; subacute toxicity studies, such as oral ad-

ministration for 90 days, dermal for 21 days, inhalation for 14 days; and reproduction studies. Supplementary toxicity studies also required include teratogenicity studies, effects on reproduction, carcinogenicity studies, metabolism effects, and the toxic effects of the metabolites formed. Acute toxicity studies must also be carried out on bees, fish and crustacea at an early stage of product development. Livestock and wild life tests during field trials or in the early commercial production stages are also required by the law. The costs inherent in such a detailed program are considered including such factors as the cost of maintaining the animals, the salary of the staff, and overhead charges.

80-1306. Boettiger, L. E. (Dep. Sci., Karolinska Hosp., S-10401 Stockholm, Sweden) **Epidemiology and aetiology of aplastic anemia.** *Haematol. Bluttransfus.* 24: 27-37; 1979 (16 references).

An analysis of the difference in prevalence of aplastic anemia between the eastern and western hemisphere is given. The frequency of aplastic anemia is found to be higher in the eastern hemisphere, with a mean of 22 cases/yr versus 4 in the western hemisphere. Age, sex, occupational hazards, differences in drug use, incidence of viral infections (hepatitis), ionizing radiation and genetic influences are discussed in relation to this difference in frequency. Toxic substances (insecticides and organic solvents) in the working environment are suggested to be causative factors. An example is given of 81 cases in Korean patients, 29 of which were associated with exposure to insecticides. It is concluded that the explanation for the differences in prevalence is multifactorial. An epidemiological study of aplastic anemia in Sweden is also presented. The incidence of the disease was found to vary greatly with age (4-61 cases per million inhabitants). Overall incidence was 13 cases per million and year. Toxic substances such as organic solvents and insecticides, as well as various drugs, are suggested to be etiologic factors.

80-1307. Dennis, W. H., Jr.; Rosencrance, A. B.; Randall, W. F.; Meier, E. P. (Med. Bioeng. Res. & Develop. Lab., US Army, Fort Detrick, MD 21701) **Acid hydrolysis of military standard formulations of diazinon.** *J. Environ. Sci. Health B* 15(1): 47-60; 1980 (7 references).

Procedures for the hydrolysis of military standard diazinon formulations were developed. Acid hydrolysis of 0.2% dust, 47.5% EC, and 0.5% oil solution of diazinon was accomplished by addition of concentrated HCl to aqueous mixtures of the pesticide formulations. Static bioassays with bluegill sunfish were used to evaluate the toxicity of the pesticide formulations, degraded pesticide reaction mixtures, and reaction products. Acid hydrolysis of all formulations at 15, 25, 35, and 45°C followed pseudo-first rate order kinetic laws. Only two major products, 4-methyl-6-isopropyl-2-pyrimidinol and *O,O*-diethylphosphorothionic acid, were found in all hydrolyzed formulations. While hydrolysis had reduced diazinon concentrations by > 99.9%, there was < 50% reduction in the toxicity of the reaction mixture to the fish. The toxic component was identified as sulfotepp, a contaminant present in all diazinon formulations.

80-1308. Whorton, M. D.; Milby, T. H.* (Environ. Health Assoc. Inc., Berkeley, CA 94704) **Recovery of testicular function among DBCP workers.** *J. Occup. Med.* 22(3): 177-179; 1980 (14 references).

The results of a 1-yr follow-up evaluation of 21 men engaged in the manufacture of 1,2-dibromochloropropane (DBCP) are reported. During the initial examination in 1977, 12 of these men were found to be azoospermic, and 9 were oligospermic (sperm count < 20×10^6 cells/ml semen). One yr later 8 of the oligospermic men had improved considerably: 6 had recovered to the normospermic state. All of the oligospermic men had been exposed to DBCP for < 4 yr. There was no improvement in sperm count among any of the azoospermic workers, 11 of whom had been exposed to DBCP for more than 4 yr. The levels of follicle stimulating hormone (FSH) among azoospermic men had shown considerable improvement ($p=0.01$) over the year's time, from a mean of 14.1 μ/ml in 1977 to 18.3 μ/ml FSH in 1978. It is suggested that DBCP induced testicular dysfunction may be reversible among moderately affected men over a fairly short period of time, but that improvement among severely affected individuals may take considerably longer periods.

80-1309. Hardell, L.; Eriksson, M.; Lenner, P. (Author address not given) **Maligna lymfom och exposition foer kemiska substanser, saerskilt organiska loesningsmedel, klorfenoler och fenoxisyror. [Malignant lymphoma and exposure to chemical substances, especially organic solvents, chlorophenols, and phenoxy acids.]** *Lakartidningen* 77(4): 208-210; 1980 (26 references) (Swedish).

The incidence of exposure to various chemical substances, including organic solvents, chlorophenols, and phenoxy acids, was studied in 169 patients (aged 25-85) with malignant lymphoma (including 60 patients with Hodgkin's disease, 105 with non-Hodgkin's lymphoma, and 4 with nonclassified lymphoma) and in 335 controls in a case-control study to determine the relative risk of exposure. The relative risk of exposure to phenoxy acids or chlorophenols was found to be 6.0 at a 95% confidence interval of 3.7-9.7. After exclusion of the subjects exposed to chlorophenols, the relative risk of exposure to phenoxy acids was found to be 4.8 (7.0 for exposure exceeding 90 days and 4.3 for exposure less than 90 days). After elimination of the subjects exposed to phenoxy acids, the relative risk of exposure to chlorophenols is 4.6 (2.5 for slight exposure and 9.3 for major exposure). The frequency of exposure to DDT was 13% in the patients and 7.8% in the controls; the corresponding percentages are 0.6% in the pa-

tients and 0% in the controls for dinoseb, 5.3% (patients) and 3.0% (controls) for organomercurial seed dressing agents, 0% (patients) and 0.6% (controls) for lindane, 0.6% (patients) and 0% (controls) for maneb and Reglone (diquat dibromide) and 0.6% (both groups) for other pesticides.

80-1310. Larripa, I.; Matos, E.; de Salum, S. B. (Inst. Invest. Hematol., Acad. Nac. Med., Buenos Aires, Argentina) **Estudio citogenetico de una poblacion humana accidentalmente expuesta a un pesticida fosforado. [Cytogenetic study of a human population accidentally exposed to an organophosphate pesticide.]** *Medicina (Buenos Aires)* 39(6): 773; 1979 (Spanish).

Thirty workers were exposed to dimethoate in the air in connection with an accident at a dimethoate-synthesizing plant due to an exothermal reaction in a tank. All patients developed intoxication symptoms. Peripheral blood samples from 20 of these workers and from 10 nonexposed controls of the same age and sex were subjected to cytogenetic study by determining the frequency of sister chromatid exchanges (SCE). The mean values obtained were 7.5-12.4 for the exposed workers and 8.2-9.2 for the controls. Dicentric chromsomes and low frequency of chromatid breaks were found in 2 exposed workers. [Presented at the 24th meeting of the Argentine Society of Clinical Investigation.]

80-1311. Gillies, A. J. D.; Taylor, A. J.* (Chest Dep., Dunedin Hosp., Dunedin, New Zealand) **Acute arsenical poisoning in Dunedin.** *N. Z. Med. J.* 89(636): 379-381; 1979 (7 references).

Four cases of acute fatal poisoning with arsenic herbicides are reported. Three patients experienced nausea, vomiting, burning esophageal pain and diarrhea, followed by shock and cardiac death with circulatory failure within 24 hr of arsenic ingestion. These 3 patients were treated with intra-muscular injections of dimercaprol. Patients 1 and 2 also received gastric lavage. Peritoneal dialysis was performed on patient 3, and dialysis fluid was found to contain < 1 mg/l arsenic. Gastric contents of patient 3 contained 17 mg/l, liver 0.29 mg/g and kidneys 0.025 mg/g arsenic as arsenic trioxide. Patient 4 died before any treatment was instituted. At autopsy edematous lungs, a slight swelling of the brain and a normal cardiovascular system were found.

80-1312. Yamaguchi, N.; Koreto, O.; Daido, R. (Hikone Cent. Hosp., Hikone, Shiga, Japan) **[A case report on DCPA (3,4-dichlorpropionanilide) intoxication.]** *Nippon Saigai-Igakkai Kaishi (Jpn. J. Accident. Med. Assoc.)* 28(1): 37-41; 1980 (13 references) (Japanese).

A 57-yr-old woman with gastric cancer attempted suicide by ingesting a cup of DCPA (propanil; 35% EC). Upon hospitalization, the patient was disoriented, and the symptoms recorded were repeated vomiting, jaundiced conjuctiva and tender, palpable, tumorous swelling of the stomach. After 4 days, Heinz bodies were noted in almost all of the erythrocytes and methemoglobinemia was diagnosed. The suicide attempt was revealed on day 4 and detoxification treatment was begun. Central nervous system depression, immature red blood cells, hemolytic anemia, fatty liver and renal injury were attributed to the DCPA poisoning. The patient died on hospital day 22.

80-1313. Durham, W. F. (US EPA, Research Triangle Park, NC 27711) **Pesticides and human health.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 83-95; 1979 (7 references).

Individual cases of toxicity and epidemiological surveys of poisonings are reviewed. The organophosphate leptophos was determined to be the cause of delayed neurotoxicity in a group of workers at a leptophos manufacturing plant. Accidental deaths from pesticide poisoning over a 20 yr period are presented; in 1956 there were 152 pesticide related deaths and in 1974, 52 deaths. California morbidity reports from 1973 indicate 1257 work injuries were pesticide related. A multiple regression analysis study of cancer death rates associated with increased agricultural activity for each 5 yr period between 1950 and 1975 showed significant associations between mortality in white males from total cancers and the percent of harvested cotton or vegetable land, except in 1960-64 and 1970-75 for vegetables and 1970-75 for cotton. Another survey of liver cancer deaths in the US indicated no change occurred in the decreasing trend of liver cancer deaths associated with organochlorine insecticide use. DDT equivalent residues in human adipose tissue in the general US population for 1955, 1961, 1963, 1970, 1971, 1972, 1973 and 1974 are presented. Total DDT levels range from 12.7 ppm in 1961 to 5.02 ppm in 1974; an overall decreasing trend is observed. Direct and indirect measurements of exposure levels of pesticides in humans and the hazards of contaminants in pesticide formulations are discussed.

80-1314. Pimentel, D.; Krummel, J.; Gallahan, D.; Hough, J.; Merrill, A.; Schriener, I.; Vittum, P.; Koziol, F.; Back, E.; Yen, D.; Fiance, S. (New York State Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **A cost-benefit analysis of pesticide use in US food.** In: *Pesticides. Contemporary Roles in Agriculture, Health and the Environment.* Sheets, T. J. and Pimentel, D., eds. (Humana Press: Clifton, NJ): pp. 97-149; 1979 (230 references).

Current patterns of pesticide use in crops, current pest losses in crops, estimated crop losses if pesticide use were curtailed, alternative biological and environmental control methods and their costs of substitution, and public

health and environmental hazards associated with pesticide use were examined to obtain a best estimate of the benefits of pesticide use in controlling crop pests. Nonchemical pest control methods, including use of natural enemies, genetics, and crops rotations, are used on about 9% of crop acres for insect control, on 90% of crop acres for plant disease control, and on about 80% of crop acres for weed control. Indirect costs of pesticide use are identified as human poisonings and fatalities, reduced fish and wildlife populations, livestock losses, destruction of susceptible crops, natural vegetation and natural enemies, honey bee losses and increases of resistance in pest populations. A 1978 estimate of the occurrence of annual, nonfatal, human pesticide poisonings was calculated to be 42,500. Accidental ingestion or inhalation accounted for 96% of the 5729 cases reported to US poison control centers in 1970. Pesticide residues in foods are regarded as low, but it is pointed out that there is insufficient information on the effects of long-term low-level exposure to pesticides. Environmental pollution is largely attributed to inefficient application of large amounts of pesticides; 65% of agricultural pesticides are applied by aircraft, and of this amount only 25-50% reaches the target crop area.

80-1315. Mabuchi, K.; Lilienfeld, A. M.; Snell, L. M. (Dep. Epidemiol., Sch. Hyg. & Public Health, Johns Hopkins Univ., Bethesda, MD 21205) **Cancer and occupational exposure to arsenic: a study of pesticide workers.** *Prev. Med.* 9(1): 51-77; 1980 (30 references).

Workers in a pesticide manufacturing and packaging plant were examined and records of mortality reviewed. Two deaths from anemias and 23 deaths from lung cancer among male workers were found to be statistically significant increases over the general population. Male production workers experienced a presumed high exposure to arsenicals for long periods of time. A dose-response effect for lung cancer mortality with increased length of arsenical exposure is suggested. Arsenism in the form of keratoses and perforation of the nasal septum was noted in increased levels among workers with high arsenic exposure. It is concluded that this is strong evidence for a causal relationship between occupational exposure to inorganic arsenicals and lung cancer.

80-1316. Vanderholm, D.; Day, D.; Warburton, D. (Agric. Eng. Dep., Univ. Illinois, Urbana, IL) **Legislative and management procedures for the control of agricultural non-point sources of pollution.** *Prog. Water Technol.* 11(6): 387-396; 1979 (1 reference).

A state-wide water quality plan to control agricultural non-point sources of pollution, developed by the state of Illinois in response to federal legislation, is summarized. The establishment of a multidisciplinary agricultural task force is described, and the work in preparing a problem assessment, identifying effective management techniques, and recommending implementation processes is discussed. Problems of soil erosion, livestock waste, pesticides, fertilizers, and forestry are considered. It was concluded that the most significant non-point sources of water contamination by pesticides come from wind or water erosion, and that persistent organochlorine insecticides have and are currently contaminating water and aquatic organisms. A state Pesticide Monitoring Board is suggested to supervise a monitoring program. The problem of disposal of used pesticide containers is also discussed; an instructional program on the proper disposal of containers and recycling of used metal pesticide containers is encouraged.

80-1317. Truhaut, R. (Cent. Rech. Toxicol., Fac. Sci. Pharmaceut. Biol., Univ. Rene Descartes, Paris, France) **Can permissible levels of carcinogenic compounds in the environment be established?** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 483-488; 1975 (14 references).

Arguments which support and those against establishing maximum allowable concentrations for carcinogens in the environment are discussed. Several practical problems are considered as well. One of the major problems in this area is that the data which is available on dose-effect relationships on very small dose levels of exposure is extremely limited. This makes it difficult to arrive at a toxicological evaluation in quantitative terms. The tolerance levels of aldrin + dieldrin, ANTU, and DDT are listed as examples of industrial carcinogenic chemicals where zero-tolerance is not considered practical yet worker exposure is a problem.

80-1318. Sternberg, S. S. (Mem. Sloan-Kettering Cancer Cent., New York, NY) **Problems in the interpretation of liver nodules.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 494-495; 1975.

A group of factory workers exposed to DDT and aldrin + dieldrin in their work were studied for possible increased occurrences of liver cancer. These workers had levels of organochlorine pesticides in their bodies which are considerably higher than the normal population. DDT intake was about 0.25 mg/kg/day for as long as 19 yr. The general population has a DDT intake of 0.0004 mg/kg/day. Aldrin + dieldrin levels in long time employees were 58 times those levels found in the general population. No increased incidence was noted of cancer in these patients, particularly no increased evidence of liver cancer nor of acute or chronic liver damage. A few workers experienced convulsions, but they recovered completely with no sequelae.

80-1319. Winkler, R.; Mueller, R.* (Akad. Landwirtschaftswiss. DDR, DDR-108 Berlin, DDR) **Beseitigung und Inaktivierung PSM-haltiger Abwaesser der Agrochemischen Zentren. [Removal and inactivation of pesticide containing wastewaters from agrochemical centers.]** *Wasserwirtsch. Wassertech.* 29(11): 369-372; 1979 (9 references) (German).

The problems of the elimination and inactivation of pesticides in pesticide containing wastewaters generated in agrochemical centers are discussed and results obtained by different methods are reviewed. In practice, it is permitted to spray such wastewaters on land not used for farming at a rate of 500 l/mo, and perhaps also on farmlands after harvest. It is possible to discharge pesticide containing effluents into industrial and some municipal wastewater plants. Some pesticides undergo photolysis by radiation: 2,4-D was found to be degraded nearly completely in about 150 hr, and dichlorprop at a rate of about 90% in 190 hr. The effectiveness of alkaline hydrolysis with lime was found to be 82.7% for simazine, 65.2% for atrazine, 63.1% for prometryne, 5.7% for 2,4-D, 2% for dichlorprop, 80.8% for lindane, 100% for dimethoate, and 63.6% for parathion. The effectiveness of adsorption on activated ash was 100% for simazine and parathion, 99.9% for atrazine, prometryne, and lindane, and 86.5% for 2,4-D.

80-1320. Foess, G. W.; Ericson, W. A. (Author address not given) **Toxic control - the trend of the future.** *Water Wastes Eng.* 17(2): 21-27; 1980 (5 references).

The control of toxic wastes in municipal wastewater is discussed. Industrial pretreatment regulations, water quality standards, sludge disposal criteria and air quality criteria are considered. Proposed water quality criteria for 65 priority toxic pollutants, including heavy metals, acrolein, aldrin, dieldrin, arsenic compounds, chlordane, pentachlorobenzene, DDT, endosulfan, endrin, methyl bromide, heptachlor, hexachlorobutadiene, hexachlorocyclohexane (BHC), lindane, hexachlorocyclopentadiene, methyl mercury, naphthalene, pentachlorophenol (PCP), 2,3,7,8-tetrachlorodibenzo- *p*-dioxin, and toxaphene, are presented in tabular form. Municipal wastewaters have been found to contain many of the pollutants mentioned; the heavy metals Cd, Cr, Cu, Pb, Hg, Ni and Zn, as well as cyanide, phenol and PCBs, are considered to be of particular concern. The control of toxic substances at treatment plants is discussed. Removal efficiencies of primary sedimentation and activated sludge treatment for some heavy metals and toxic organics are presented in tabular form. Chemical oxidation, chemical preparation and coagulation, filtration, activated carbon adsorption, chelation, ion exchange, reverse osmosis, incineration and wet air oxidation are also discussed. Toxic organics have been found in primary sludge, and are also incorporated into activated sludge. Chlorinated hydrocarbons, long chain unsaturated fatty acids, aromatic amines and phenolic compounds have been found to be resistant to adsorption by activated carbon.

80-1321. Haberer, V. K.; Wendling-Edler, I. (ESWE Inst. Wasserforsch. & Wassertechnol. GmbH Wiesbaden, Wiesbaden, BRD) **Zur Schadstoffeliminierung bei der Wasseraufbereitung II. Eliminierungsuntersuchungen und ihre Ergebnisse. [Pollutant removal in water preparation. II. Elimination studies and their results.]** *Z. Wasser Abwasser Forsch.* 12(6): 230-236; 1979 (19 references) (German).

The elimination of 34 chemical substances from water by coagulation, sand filtration and activated carbon adsorption with and without chlorination (4 mg/l) was studied. Without chlorination, sand filtration following coagulation had an efficiency of 16% for parathion, 33% for hexachlorobenzene, 74% for methoxychlor, 82% for aldrin, 100% for DDT, 0% for lindane, 43% for dieldrin, and 23% for endrin. With chlorination, the efficiency was 56% for parathion, 21% for endosulfan, 59% for hexachlorobenzene, 74% for methoxychlor, 100% for aldrin and DDT, 21% for lindane, 51% for dieldrin, and 43% for endrin. The effectiveness of adsorption on granular activated carbon following coagulation and sand filtration was 100% for all pesticides.

See also 80-1206, 80-1215, 80-1218, 80-1239, 80-1243, 80-1271, 80-1289 *and* 80-1364.

80-1322. Silkworth, J. B.; Loose, L. D. (Inst. Comp. & Human Toxicol., Albany Med. Coll., Albany, NY) **Environmental chemical-induced modification of cell-mediated immune responses.** *Adv. Exp. Med. Biol.* 121A: 499-522; 1980 (41 references).

The effects of environmental chemicals on the host defense mechanism and immune system were investigated. Male and female C57Bl/6 Tex, B6D2F1, and Balb/c mice were fed diets containing either 167 ppm Arachlor 1016 (PCB) or 167 ppm hexachlorobenzene (HCB). PCB had no influence on the graft-*vs*-host activity or the mixed lymphocyte responsiveness of spleen cells isolated from the animals. HCB administration resulted in an approximately 20% suppression of spleen cell activity in the graft-*vs*-host response, a 44% reduction in mixed lymphocyte cultures, and a 68% reduction of peak control cell response to mitogen stimulation.

80-1323. Ceglowski, W. S.; Ercegrovich, C. D.; Pearson, N. S. (Dep. Microbiol. & Cell Biol., Pennsylvania State Univ., University Park, PA) **Effects of pesticides on the reticuloendothelial system.** *Adv. Exp. Med. Biol.* 121A: 569-576; 1980 (14 references).

The effects of several pesticides on the reticuloendothelial systems of different animals are reviewed. DDT has been shown to lower levels of circulating antibodies by as much as 30% in rats, and alter immune responsiveness to sheep erythrocyte challenge in chickens and mice. Significant reduction in antibody titers of rats have been observed following administration of parathion. Oral doses of carbaryl or chlordimeform to mice resulted in significant reduction in antibody plaque forming cell numbers. With the present available information it is difficult to formulate general conclusions about the effects of pesticides on the reticuloendothelial system. It is not known if pesticides within a single chemical class act in similar manner in their ability to influence the immune system function. In addition, any relationship between the toxic, mutagenic, teratogenic, or carcinogenic potential of any pesticide and its ability to alter the reticuloendothelial system is also unknown.

80-1324. Birnbaum, L. S. (Masonic Med. Res. Lab., Utica, NY 13503) **Enhanced metabolism of 7-ethoxycoumarin in senescent rodents.** *Age* 2(4): 125; 1979.

Male CFN rats and C5BL/6J mice of 3, 12, and 24 mo old were kept under controlled conditions. Liver microsomes were prepared and assayed for mixed function oxidase component content. Both benzo(a)pyrene and the deethylation of 7-ethoxycoumarin were found to be increased over 100% in senescent mice when compared to young adults. In aging rats the linkage between these activities was lost. Benzo(a)pyrene hydroxylase activity decreased, while 7-ethoxycoumarin deethylation increased sharply.

80-1325. Cunningham, H. M. (Toxicol. Eval. Div., Food Dir., Health Prot. Branch, Health & Welfare Canada, Ontario, Canada) **Effect of sodium hypochlorite on the growth of rats and guinea pigs.** *Am. J. Vet. Res.* 41(2): 295-297; 1980 (4 references).

Sodium hypochlorite is commonly used as a bactericide in the dairy industry, and is often found as a contaminant of milk. Experiments were conducted to determine the effects of adding sodium hypochlorite to the drinking water and milk of rats and guinea pigs. Available chlorine concentrations were 0-2000 mg/l for periods of 9 days to 6 wk. A stimulation of weight gain was noted in all exposed animals. The optimal growth rate was noted with available chlorine concentrations of 20 mg/l in liquids given by free choice and at 8 mg/kg in tests where the chemical was given by gavage. Sodium hypochlorite did not cause any observable toxic effects at concentrations below 2000 mg/l.

80-1326. Carrera, G.; Mitjavila, S. (Inst. Physiol., F-31400 Toulouse, France) **Effet de la mobilisation du DDT par le jeune chez le rat. [The effect of DDT mobilization due to fasting in the rat.]** *Ann. Nutr. Aliment.* 33(4): 472; 1979 (French).

DDT was orally administered to rats for 30 (group A) or 51 (group B) days at 20 mg/kg/day. After the treatment period animals were starved for 3 days, then fed for 15 days (20g food/day/rat for group A and 5 g for group B). Group B was then fed *ad libitum* in metabolic cages for 7 days. Body composition and activities of various hepatic and plasma enzymes were studied to determine recovery capacities and resistance to fasting. The level of DDT in group A animals at the end of insecticide administration was found to be equivalent to that in animals that had orally received 200 mg DDT (LD50 in oil solution). Group B animals contained twice the level found in group A animals. Although all stored DDT was mobilized, no large variation in body composition or enzyme activity were found at the end of the experiment.

80-1327. Aldridge, W. N. (Toxicol. Unit, MRC Lab., Carshalton, Surrey, England) **Insecticides, past, present and future: practice and the understanding of mechanisms.** *Ann. Occup. Hyg.* 22(4): 407-409; 1979 (11 references).

Studies of the mechanisms of toxicity of chlorinated hydrocarbon (DDT), organophosphate and pyrethroid insecticides are reviewed. DDT is a persistent insecticide that has been found to effect mammalian sodium channels, to be an inducer of hepatic and renal drug metabolizing enzymes, and to be carcinogenic to certain strains of mice. Organophosphates break down in the environment, are insecticidal due to inhibition of acetylcholinesterase, and cause acute toxicity and delayed neuropathy in mammals. Pyrethroids have a high insecticidal activity and a light stability. The mechanism of ac-

tion is not completely understood, but is suggested to be similar to the influence of DDT on nerve conduction.

80-1328. Feroz, M.; Khan, M. A. Q.* (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Metabolism of ^{14}C heptachlor in goldfish (*Carassius auratus*).** *Arch. Environ. Contam. Toxicol.* 8(5): 519-531; 1979 (30 references).

Goldfish injected with ^{14}C heptachlor (38.2 μg/44 g fish) eliminated about 18% of the dose in 10 days. Analyses of the fish at the end of 10 days revealed the presence of 5 compounds of which 91.2% was unchanged heptachlor and the remainder was heptachlor epoxide (5.4%), 1-hydroxychlordene (1.0%), 1-hydroxy2,3-epoxychlordene (1.1%) and a conjugate (1.2%). The conjugate, on acid hydrolysis, yielded a product more polar than dihydroxyheptachlor, most likely a trihydroxy product. Analyses of feces and water showed the presence of only polar products. (Author abstract by permission)

80-1329. Short, R. D.; Minor, J. L.; Lee, C. C.; Chernoff, N.; Baron, R. L. (Midwest Res. Inst., Kansas City, MO 64110) **Developmental toxicity of Guthion in rats and mice.** *Arch. Toxicol.* 43(3): 177-186; 1980 (14 references).

The purpose of this study was to assess the effects of Guthion (azinphos-methyl), a pesticide with anticholinesterase activity, on development in rats and mice. A preliminary toxicity study with Guthion indicated that a 35-day LD50 dose for virgin rats and a 10-day LD50 dose for virgin mice was between 4 and 8 mg/kg/day for both species. On the basis of these data, doses of 0, 1.25, 2.5, and 5.0 mg/kg/day were selected for the developmental study, which consisted of two phases. During the first phase, pregnant rats and mice were treated for 10 days starting on gestational day 6. The high dose affected maternal welfare only in rats. Guthion did not significantly increase in a dose-related manner any of the specific anomalies observed in either rats or mice. During the second phase, pregnant rats were treated from gestational day 6 to postpartum day 21. Dams in the high dose group were more sensitive to Guthion later in gestation with the result that deaths and signs of anticholinesterase toxicity increased during this time. Guthion also adversely affected maternal welfare in this group. As a result of Guthion toxicity, only one litter survived until weaning. The inability to dissociate toxicity in adult and developing animals suggests that Guthion has little primary effect on the development of rats or mice. (Author abstract by permission)

80-1330. Vogel, E. (Dep. Radiat. Genet. & Chem. Mutagenesis, Sylvius Lab., Univ. Leiden, Leiden, The Netherlands) **Genetical relationship between resistance to insecticides and procarcinogens in two *Drosophila* populations.** *Arch. Toxicol.* 43(3): 201-211; 1980 (27 references).

Two *Drosophila* populations, one resistant and the other susceptible to several insecticides [DDT, chlordane, parathion, dinitrocresol (DNOC), and oxydemeton-methyl], were examined for response to several alkaryltriazines (2,4,6-Cl_3-PDMT; 3-PyDMT; 3-PyDET) and to DMN, DEN and AM. Hikone R (HR) males developed relative resistance to both mutation induction and cell killing by the triazenes, whereas Berlin K (BK) males showed increased tolerance to DMN, DEN, and AM. When F_1 hybrid males from the two strains were treated with 2,4,6-Cl_3-PDMT, the yield of recessive lethal mutations in the heterozygotes was nearly half of that found in homozygotes from the susceptible strain Berlin K. These findings indicate that in *Drosophila* metabolism of procarcinogens is controlled by multiple-gene systems located on several chromosomes. An extremely divergent response of the two genotypes was found following treatment with 3-PyDET; this triazene acts a a potent mutagen in BK males but is hardly mutagenic when tested in strain HR. (Author abstract by permission)

80-1331. Wilhelm, K.; Fajdetic, A.; Deljac, V.; Binenfeld, Z. (Inst. Med. Res. & Occup. Health, Fac. Nat. Sci. & Math., Univ. Zagreb, Zagreb, Yugoslavia) **Protective effect of dexetimide and HI-6 in poisoning with highly toxic organophosphorus compounds.** *Arh. Hig. Rada Toksikol.* 30(2): 147-151; 1979 (8 references).

Studies on the protective effect of dexetemide, HI-6 {[2-hydroxyiminomethylpyrididiummethyl) -(4'-carbamoylpyridinium- methyl)]ether dichloride}, PAM-2Cl (1-methyl-2-hydroxyiminomethylpyridinium chloride; pralidoxime chloride and atropine in poisoning by organophospates were conducted. Rats and mice were poisoned with ethyl diisopropylaminoethyl methylthiophosphonate (VX) and soman, then given a series of the antidotes singly or in combination. Soman poisoning was not reduced by any of the antidote combinations when HI-6 was excluded. HI-6 alone provided weak protection. HI-6 in combination with other antidotes provided greater protection. In VX poisoning all antidotes afforded protection, but HI-6 was the most effective antidote for VX and soman poisoning.

80-1332. Hislop, I. G.; Zilko, P. J.; Petersen, M.; Ahmed, N. (Dep. Med., Fremantle Hosp., Fremantle 6160, Australia) **Dermal necrosis following coumarin: is it immunologically induced?** *Aust. N. Z. J. Med.* 10(1): 51-53; 1980 (10 references).

Two cases of dermal necrosis due to warfarin anticoagulation therapy are reported. Disordered immune function and immunoregulation were noted in both patients, and it is suggested that this may have been a predisposing factor leading to a hypersensitivity reaction to coumarin. It is suggested that warfarin may act as a hapten in the induction of coumarin hypersensitivity. It is conclud-

ed that further studies are needed to determine whether there is an immunoregulatory defect, and if the typical skin lesions are due to circulating immune complexes.

80-1333. Wheeler, S. H. (Agric. Protect. Board Western Australia, South Perth, W.A. 6151, Australia) **The toxicity of sodium monofluoroacetate to wild rabbits, *Oryctolagus cuniculus*, from three sites in western Australia.** *Aust. Wildl. Res.* 6(1): 57-62; 1979 (13 references).

Wild rabbits collected from 3 locations in Western Australia were exposed to various doses of Na-monofluoroacetate. The animals received ip doses of 0, 0.092, 0.184, 0.368, 0.736, or 1.472 mg/kg body wt of the chemical in the field. LD50 values for the rabbits from the test sites did not significantly differ from each other, even though at 2 of the sites the rabbits can be exposed to Na-monofluoroacetate by ingesting native plants of the genera *Gastrolobium* and *Oxylobium*. The lack of significant regional differences in tolerance and selective pressures for adaptation to Na-monofluoroacetate in wild rabbits are discussed.

80-1334. Clothier, B.; Johnson, M. K. (Mol. Toxicol. Sect., Toxicol. Unit, Med. Res. Counc., Carshalton, Surrey SM5 4EF, England) **Reactivation and aging of neurotoxic esterase inhibited by a variety of organophosphorus esters.** *Biochem. J.* 185(3): 739-747; 1980 (13 references).

It was proposed that both inhibition of neurotoxic esterase of nervous tissue and subsequent aging of the inhibited esterase are necessary events in the pathogenesis of organophosphate-induced delayed neuropathy: aging has now been demonstrated with a number of neurotoxic compounds. Reactivation by KF was observed for hen brain neurotoxic esterase inhibited by 14 organophosphates and phosphonates, and time-dependent loss of reactivatibility (aging) occurred in every case. For five other compounds no reactivation occurred and aging could not therefore be established, but independent evidence for two compounds suggests that aging was rapid. Half-lives of aging of neurotoxic esterase inhibited by phosphates ranged from less than 1 min to 10 min, and for phosphonates the range was 3-600 min. The relationship of these findings to the mechanism of toxicity and to the prospects of therapy are considered. Aging occurred rapidly with aryloxy and linear alkoxy groups attached to phosphorus and slowly with a highly branched alkoxy substituent: these effects seem incompatible with an S_N1 (dealkylation) mechanism. (Author abstract by permission)

80-1335. Civen, M.; Leeb, J. E.; Wishnow, R. M.; Wolfsen, A.; Morin, R. J. (Med. Res. Programs, VA Hosp., Long Beach, CA 90822) **Effects of low level administration of dichlorvos on adrenocorticotrophic hormone secretion, adrenal cholesteryl ester and steroid metabolism.** *Biochem. Pharmacol.* 29(4): 635-641; 1980 (23 references).

The effects of the organophosphate insecticide dichlorvos on diurnal changes in the rat pituitary-adrenal axis have been studied. At 2 ppm in the drinking water, it did not inhibit erythrocyte or plasma acetylcholinesterase activity. Dichlorvos ingestion markedly increased plasma adrenocorticotrophic hormone (ACTH) levels at the 9:00 AM sampling period, but did not furter enhance the diurnally elevated ACTH levels at 5:00 PM. Adrenal acylCoA:cholesterol acyltransferase (ACAT) and neutral cytosolic cholesterol ester hydrolase (CE hydrolase) were significantly inhibited at 9:00 AM while at 5:00 PM the enzymes were stimulated. Adrenal cholesterol ester levels were depressed at 9:00 AM and increased at 5:00 PM. Adrenal free cholesterol levels did not change. Neither adrenal nor plasma corticosterone levels were significantly altered after dichlorvos. The results indicate that significant alterations in adrenal cholesterol ester levels may take place without corresponding changes in plasma and adrenal corticosterone levels. (Author abstract by permission)

80-1336. Kielbasinska, E.; Rozalski, M.; Wierzbicki, R. (Inst. Biochem., Coll. Environ. & Bioanal. Res., Acad. Med., Lodz, Poland) **Wiazanie rteci przez hemoglobine szczurow eksponowanych na octan fenylorteciowy, chlorek metylorteciowy i chlorek rteciowy. [Binding of mercury hemoglobin in rats exposed to phenylmercuric acetate, methylmercuric chloride, and mercuric chloride.]** *Bromatol. Chem. Toksykol.* 12(1): 53-59; 1979 (15 references) (Polish).

Single 17.9 mg/kg doses of phenylmercuric acetate (PMA), methylmercuric chloride, or mercuric chloride were administered to rats. Serum, blood, RBC, and hemoglobin Hg levels were determined. The highest Hg levels in blood (30.9 $\mu g/cm^3$) and hemoglobin (0.49 μg/mg hemoglobin) were found in animals treated with methylmercuric chloride. Hemoglobin Hg content in animals exposed to PMA and mercuric chloride were 3 and 70 times, respectively, lower than in rats dosed with methylmercuric chloride.

80-1337. Folmar, L. C. (Northwest & Alaska Fish. Cent., NOAA, Seattle, WA 98112) **Effects of short-term field applications of acrolein and 2,4-D (DMA) on flavor of the flesh of rainbow trout.** *Bull. Environ. Contam. Toxicol.* 24(1): 217-224; 1980 (17 references).

Rainbow trout, *Salmo gairdneri*, stock were acclimated to experimental canals for 30 days before treatment of the water with various concentrations of acrolein or 2,4-D. Analysis of water samples showed that acrolein was present at 0.02, 0.07, and 0.09 mg/l, and 2,4-D at 0.05,

0.09, and 0.5 mg/l in the experimental canals. Fish were exposed for 4 hr to simulate actual field conditions. No residues were found in water samples collected at 1, 4, and 7 days post-exposure when fish were sacrificed. Trout exposed to 0.07 mg/l acrolein for 7 days were lost to predators. Both fillets of the remaining fish were removed; one was used for residue analysis, the other for organoleptic analysis. Organoleptic ratings were done by a panel of trained volunteers on unseasoned baked fillets. The fish were ranked on a six point scale from very undesirable to very desirable, and their numerical ranks were compared to residue concentrations by analysis of variance. Fish exposed to 2,4-D (0.5 mg/l) for 1, 4, and 7 days, and to acrolein (0.1 mg/l) for 1 and 4 days were considered inferior in taste. Control trout were considered to taste significantly better than acceptable fish at all three sample times. Regression analysis revealed that fish exposed to 2,4-D would take longer to return to acceptable levels of palatability than would fish exposed to acrolein. It is suggested that these findings be considered before herbicides are used where edible fish may reside.

80-1338. Wszolek, P. C.; Lein, D. H.; Lisk, D. J. (Pestic. Residue Lab., Dep. Food Sci., New York State Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **Excretion of fenvalerate insecticide in the milk of dairy cows.** *Bull. Environ. Contam. Toxicol.* 24(1): 296-298; 1980 (3 references).

Fenvalerate was fed daily to two Holstein cows at levels of 5 ppm and 15 ppm, respectively. Based on a daily ration of 22.7 kg feed/cow, the total insecticide ingested was 0.454 and 1.363 g, respectively. Total daily mixed milk samples and feces samples were collected one day prior to insecticide feeding, daily throughout the feeding period and 6 days after, and were freeze-dried for fenvalerate analysis by gas chromatography. The total excretion of fenvalerate in the milk of the cows dosed with 5 and 15 ppm of the compound was only 0.44 and 0.64% of the total dose, respectively. About 25% of the total dose of insecticide in each cow was eliminated through the feces. It is suggested that hydrolysis of the carboxy ester linkage of fenvalerate occurs, resulting in the excretion of the corresponding acid and alcohol conjugates in the feces and in urine.

80-1339. Sastry, K. V.; Sharma, K. (Dep. Zool., Sch. Environ. Contam. & Toxicol., DAV (PG) Coll., Muzaffarnager, India) **Diazinon effect on the activities of brain enzymes from *Ophiocephalus (Channa) punctatus*.** *Bull. Environ. Contam. Toxicol.* 24(3): 326-333; 1980 (34 references).

The effects of the acaricide and insecticide diazinon on brain enzymes were determined in a series of experiments on the teleost fish *Ophiocephalus (Channa) punctatus*. Groups of fish were exposed to 0.31 mg/l for 15 and 30 days and to 3.1 mg/l for 96 hr. A fourth group served as a control. All surviving fish were sacrificed and brain enzymes extracted. With only 2 exceptions, the activities of all enzymes increased in the treated group. The largest increase in activity (78%) was seen for succinic dehydrogenase in the 96 hr test. The lowest changes in activity were −2% for both alkaline phosphatase in the 15 day study and ATPase in the 30 day test. The proposed mode of action of organophosphates on vertebrates is discussed.

80-1340. Zabik, M. E.; Zabik, M. J. (Dep. Food Sci. & Human Nutr., Pestic. Res. Cent. Michigan State Univ., East Lansing, MI 48024) **Dioxin levels in raw and cooked liver, loin steaks, round, and patties from beef fed technical grade pentachlorophenol.** *Bull. Environ. Contam. Toxicol.* 24(3): 344-349; 1980 (5 references).

Studies were performed to determine the levels of dioxin in various raw and cooked cuts of meat from beef fed pentachlorophenol (PCP). Cattle were fed 0.2 mg/kg a day for 75 days, then 2.0 mg/kg daily for 60 days. After slaughter, muscle and liver tissues were analyzed by electron capture gas chromatography. Octa-, hepta- and hexadioxin levels are presented for muscle and fat of cooked and raw samples. Octa dioxin was in the greatest abundance in both types of samples. Hepta and hexa were generally not detected. Liver had the highest amounts of each isomer, with the greatest concentrations in liver tissues and fat. Cooking reduced the dioxin levels in liver (−20%), well cooked ground round (−10%), and hamburger (−10%). Longissimus dorsi levels after cooking were increased 77%, and stew meat levels were as much as 43% higher. It is concluded that a health hazard exists if cattle exposed to dioxin are slaughtered for human consumption.

80-1341. Fattah, K. M. A.; Crowder, L. A.* (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721) **Plasma membrane ATPases from various tissues of the cockroach (*Periplaneta americana*) and mouse influenced by toxaphene.** *Bull. Environ. Contam. Toxicol.* 24(3): 356-363; 1980 (9 references).

The *in vivo* and *in vitro* effects of toxaphene on ATPase activity in various mouse and cockroach tissues were determined. Mice were treated with 112 mg toxaphene/kg body wt and killed 60-90 min after treatments. *In vitro* studies involved exposure of cockroach tissues (central nervous system and Malpighian tubules) and mouse tissues (kidney, liver and brain) to 10^{-4}, 10^{-5}, 10^{-6} and 10^{-7} *M* toxaphene solutions. Results of the *in vivo* tests found kidney ATPase to be most sensitive to toxaphene; inhibition was 12.6% for Na^+,K^+ ATPase and 15% for Mg^{2+} ATPase. Mg^{2+} ATPase was found to be more sensitive to toxaphene than Na^+,K^+ ATPase in all tissues. *In vitro* administration of toxaphene also produced the greatest effect on the kidney. A dose related inhibition in

kidney tissues was noted. Maximum effect was 44% inhibition of Na + K + ATPase by 10^{-4} *M* toxaphene. Inhibition of liver ATPases was also observed. No effect on brain ATPases was found. Analysis of enzyme activities in cockroaches showed a dose dependent effect for all ATPases. The maximum inhibition of 58.9% was produced in the central nervous system by 10^{-4} *M* toxaphene.

80-1342. Calabrese, E. J.; Moore, G. S.; Ho, S. C. (Div. Public Health, Univ. Massachusetts, Amherst, MA 01003) **Low glucose-6-phosphate dehydrogenase activity and increased sensitivity to paraquat toxicity.** *Bull. Environ. Contam. Toxicol.* 24(3): 369-373; 1980 (10 references).

Blood levels of glucose-6-phosphate dehydrogenase (G-6-PD) and sensitivities to paraquat were compared among 2 groups of humans and a group of sheep. Blood was collected from 6 G-6-PD deficient adult humans, 5 adults with normal enzyme levels, and 6 nonpregnant female sheep and methemoglobin (MetH) formation and glutathione (GSH) levels were determined. MetH formation increased in paraquat-treated sheep and enzyme-deficient human blood but no increase was observed in paraquat-treated normal human blood. MetH increased by ~ 300% in sheep and deficient human paraquat-treated blood compared to unexposed controls. GSH content decreased by 11.5% in treated sheep blood, by 15.0% in G-6-PD deficient human blood, and by 0.03% for normal human treated blood. No statistically significant changes in G-6-PD activity was observed in any of the blood groups treated with paraquat.

80-1343. Muthu, M.; Krishnakumari, M. K.; Muralidhara; Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore 570013, India) **A study on the acute inhalation toxicity of phosphine to albino rats.** *Bull. Environ. Contam. Toxicol.* 24(3): 404-410; 1980 (9 references).

Adult, female, CFT-Wister, albino rats were exposed in an insulted aluminum atmospheric vault to phosphine gas generated by aluminum phosphide pellets in distilled water. A phosphine detection tube was used for analyzing phosphine concentrations in the chamber. The concentrations were plotted against exposure times, and the concentration-time curves were drawn. The integrated concentration-time products were computed by measuring the area under the curve. After exposure, the mortality and symptoms of the animals were recorded; survivors were observed for 4 wk. At the end of the observation period, survivors were sacrificed and histopathological examinations of various tissues were carried out. The concentration range of phosphine was from 20 to 60 ppm, and exposure time from 4 to 8 hr. Exposure to 20 ppm phosphine for 6 hr resulted in 33.3% mortality, and exposure to 40 ppm for 6 hr resulted in 100% mortality. The symptoms observed during exposure included polyuria, dyspnea, loss of muscular coordination, and paralysis. Body wt decreased at the end of wk 1, probably due to decreased food intake, but returned to normal range. Histopathologically, most damage occurred in the lungs, which showed mild to severe cellular infiltration around the bronchioles. The LC50 values were 0.22 mg/hr/l at 27°C and 0.36 mg/hr/l at 26.1°C.

80-1344. Crowder, L. A.; Whitson, R. S. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721) **Fate of toxaphene, methyl parathion, and chlordimeform combinations in the mouse.** *Bull. Environ. Contam. Toxicol.* 24(3): 444-451; 1980 (13 references).

Male Swiss mice were used in studies designed to determine if combinations of methyl parathion (MP), toxaphene (T), and chlordimeform (C) affect the excretion, retention or mortality of any of the individual compounds. Mice were orally dosed with each compound alone and in combination with the other compounds at 25 mg/kg T, 12.5 mg/kg MP, and 3.25 mg/kg C. Urine and feces were collected and mortality counts made at various intervals. After 192 hr, one mouse from each replicate was sacrificed and later analyzed for tissue retention, and the remaining animals were given an additional dose (redosed). Radioassay of feces and tissue samples was performed using scintillation counting techniques. The excretion of radioactivity derived from ^{36}Cl-T in the urine was not altered by combinations of C and/or MP, but in the feces, less ^{36}Cl was excreted when combined with MP or C-MP. The excretion of ^{14}C following a single oral dose of ^{14}C-C was not altered by combination with T and/or MP; however, the excretion of PNP, a metabolite of MP, was decreased by the addition of T. With regard to retention, lipids displayed no significant changes as a result of combining T with C and/or MP. Addition of C to T resulted in more ^{36}Cl being deposited in the brain, muscle and testes, and the T-MP combination resulted in more ^{36}Cl retained by tissues increased after a redose. The addition of T and/or MP to C resulted in lower ^{14}C deposition in some tissues. Mortality occurred only in treatments containing MP, and all mortality occurred within 3 hr of dosing.

80-1345. Malmqvist, E. (Ostergoetland Cent. Hosp., Norrkoeping, Sweden) **The influence of paraquat on the *in vivo* incorporation of lecithin precursors in lung tissue and alveolar lecithin.** *Bull. Eur. Physiopathol. Respir.* 15(6): 70p-71p; 1979.

Labeled lecithin precursors (^{14}C palmitic acid and ^{14}C choline) were administered 12 hr prior to sacrifice to rats exposed to paraquat for 14 or 48 hr. At the time of sacrifice all animals experienced respiratory difficulties. Although the respiratory distress was more pronounced in animals intoxicated with paraquat for 48 hr, the alveolar lecithin was already reduced to minimum low levels within 14 hr of pesticide administration. Palmitic acid was incorporated at the same rate in both alveolar and lung tissue

lecithin, and was not disturbed by paraquat. ^{14}C Choline was taken up at a much higher rate by alveolar tissue lecithin and was not affected by paraquat. The choline pathway appears to be the main source of alveolar lecithin; following paraquat poisoning lecithin is supplied by another, slower, pathway.

80-1346. Kunc, L.; Kuncova, M.; Soldan, F.; Holusa, R.; Antalikova, L. (Reg. Hyg. Stn., Ostrava, Czechoslovakia) **Interaction of paraquat with lung surfactant.** *Bull. Eur. Physiopathol. Respir.* 15(6): 71p; 1979.

Thirty-two rats were given sc injections of 30 mg/kg paraquat. Congestion, hemorrhage, edema, and atelectasis of the lungs were observed within 6-31 hr after injection of the pesticide. Progredient deterioration of surfactant (Wilhelmy balance) occurred with a steady decrease of hysteresia loop areas, accompanied by a biphasic rise in γ min. Protein, cholesterol, and total lipid levels rose linearly and biphasically after 16, 22, and 23.5 hr of paraquat exposure, respectively. *In vitro* experiments showed that paraquat possesses surface activity and adsorbs from bulk solution to water air interface, and penetrates existing monomolecular films within 5 min. Paraquat also has the ability to penetrate organized biological bilayers. Direct action on cell membranes and lung surfactant by the pesticide may play a role in its mode of poisoning.

80-1347. Truhaut, R. (Cent. Rech. Toxicol., UER Mec. Act. Med. Tox., Fac. Pharm. & Biol., Univ. Rene-Descartes, F-75270 Paris Cedex 06, France) **Influence de l'α-tocopherol (vitamine E) sur l'utilisation de la vitamine A et l'induction du cytochrome P 450 chez le rat recevant du DDT. [Influence of α-tocopherol (vitamin E) on vitamin A utilization and on cytochrome P-450 induction in rats treated with DDT.]** *C. R. Acad. Sci. Ser. D* 289(12): 845-847; 1979 (3 references) (French).

The effect of α-tocopherol on vitamin A utilization and cytochrome P-450 induction was studied in young male Wistar rats treated with DDT (5 mg). The dose of DL-α-tocopherol acetate was 5 mg. The administration of DDT caused increased vitamin A utilization and a highly significant increase in the cytochrome P-450 level in the liver. In the groups not treated with retinol, the mortality was high, and it was not reduced by the administration of α-tocopherol. The findings indicate an interference between vitamin E and vitamin A in the detoxication of DDT. Vitamin E seems to permit a better utilization of retinol in the reactions in which it participates. However, the hepatic cytochrome P-450 level was relatively reduced in the animals treated simultaneously with vitamins A and E and DDT compared with those not treated with vitamin E, which may suggest a direct involvement of vitamin E.

80-1348. Albrecht, R. (Lab. Biol., Inst. Sci. & Tech. Aliment., CNAM, Paris III, France) **Problemes biologiques pose par deux pesticides courants: le lindane et le zinebe. [Biological problems posed by two currently-used pesticides: lindane and zineb.]** *Cah. Nutr. Diet.* 14(1): 49-61; 1979 (115 references) (French).

Hygienic and toxicological studies on lindane and zineb are reviewed. Lindane is present in practically all organs upon exposure, but the accumulation is mammals is rather limited. Lindane is metabolized to 2,4,5-trichlorophenol via hexachlorocyclohexanol, 2,3,4,5,6-pentachlorocyclohexanone, and 2,4,6-trichlorocyclohexa-(2,5)-dienone. The acute intoxication symptoms include fatty degeneration of cells in the CNS, vacuolar and fatty degeneration and necrosis in the liver, swelling, hyaline or fatty degeneration of the tubular epithelium in the kidneys, exudation, alveolar inflammation and bronchopneumonia in the lungs upon inhalation, and petechial inflammation and focal necroses in the intestines. Some studies suggest the hepatocarcinogenic effect of lindane in mice. It interferes with the reproductive functions of mammals at doses below the current no-effect level of 1.25 mg/kg/day. Zineb has a very low acute and subacute toxicity (the po LD50 in rats is above 5200 mg/kg. No mutagenic effects were found in *Drosophila melanogaster*, but chromosomal aberrations were found in lymphocytes of workers exposed to zineb. Sterility, fetal resorption, and caudal anomalies in newborn rats were found in an experiment in which rats were treated with 100 mg/kg/day doses for 2-6 mo. Ethylene thiourea (ETU), one of the metabolites of zineb, is more toxic than the initial compound; its po LD50 in rats is 1.8 mg/kg, and it has mutagenic and teratogenic effects.

80-1349. Morgan, D. G.; Petras, M. L. (Dep. Biol., Univ. Windsor, Windsor, Ontario, Canada) **Variability in response to warfarin in natural populations of the house mouse.** *Can. J. Genet. Cytol.* 21(4): 573; 1979.

Wild mice were given food containing 0.025% warfarin for 21 days. In tests performed in Ontario, the mean warfarin doses for animals that died and for those that survived were 525.6 and 968.1 mg/kg, respectively. Similar testing in New York gave respective concentrations of 301.7 and 509.2 mg/kg. In animals resistant to warfarin, the concentrations were 544.3 and 639.7 mg/kg, respectively. No association was noted between the resistance to warfarin and either the β-chain variant of hemoglobin or the glucose phosphate isomerase phenotypes.

80-1350. Morton, R. A.; Safranyos, R. G. (McMaster Univ., Hamilton, Ontario, Canada) **Relationship between acetylcholinesterase activity and malathion resistance in *D. melanogaster*.** *Can. J. Genet. Cytol.* 21(4): 573-574; 1979.

KT50 (50% knockdown time) values were found to vary considerably in iso-female lines of *D. melanogaster*. It is suggested that there are several different genes which af-

fect malathion sensitivity. A negative correlation was noted between the specific activity of acetylcholinesterase in crude extracts of fly heads and the KT50. Smaller specific activities were found in the more resistant lines. When crossed to canton S, a group of malathion-selected flies produced an F1 which had intermediate specific activity and resistance.

80-1351. Pluthero, F. G.; Threlkeld, S. F. H. (McMaster Univ., Hamilton, Ontario, Canada) **Genetic differences in response to insecticides in several strains of *Drosophila melanogaster*.** *Can. J. Genet. Cytol.* 21(4): 577; 1979.

Various strains of *Drosophila melanogaster* were given single doses of different insecticides. Others were exposed to filter paper which had been impregnated with the insecticide. In still other tests flies were given a choice between insecticide treated surfaces and untreated ones. Various reactions were noted both in insecticide resistance and in behavior responses to the offered choice. Cross resistance to several organophosphates and a synthetic pyrethrin were noted.

80-1352. Acorn, T.; Gibson, M. A. (Dep. Biol., Acadia Univ.; Wolfville, Nova Scotia B0P 1X0, Canada) **Histogenesis of the yolk sac in malathion treated chick embryos.** *Can. J. Zool.* 57(12): 2325-2330; 1979 (19 references).

Chick embryos were given a teratogenic dose of malathion at the 5-day incubation stage and the effects of this treatment on the histogenesis and histochemistry of the yolk were studied. The malathion caused a decrease in the amount of hemopoietic tissue. Also, the endodermal cells had decreased glycogen and lipid storage, decreased glycoprotein and acid mucopolysaccharide staining intensities, and decreased acid phosphatase activity. These observations suggest an interference with carbohydrate and lipid uptake and storage by the yolk sac. (Author abstract by permission)

80-1353. Anonymous **EPA herbicide probe finds no adverse effects.** *Chem. Mark. Rep.* 217(11): 3, 32; 1980.

The Environmental Protection Agency has decided not to bring regulatory action against E. Lilly & Co. and 9 other manufacturers of the herbicide oryzalin. However, because of continuing uncertainty over reported human health effects to children of workers manufacturing the pesticide, the Agency has required Lilly to carry out additional toxicological studies on animals concerning potential harmful health effects. Two other agencies, OSHA and NIOSH, are still investigating charges made by the International Chemical Workers Union that birth defects and reproductive impairment have been suffered by those exposed to oryzalin. Three teratology studies and a multigeneration reproduction study on oryzalin, demonstrating that the chemical does not cause birth defects or adverse reproductive effects, are mentioned.

80-1354. de Lange, C. A. (Author address not given) **Test op kankerverwekkend karakter van stoffen niet waterdicht. [Carcinogenicity test of substances not watertight.]** *Chem. Weekbl.* 70(51-52): 19; 1980 (Dutch).

Auxiliary studies on the hepatocarcinogenicity of dieldrin in experimental animals are reviewed. Dieldrin, which was found to induce liver tumors in mice, was also found to increase the activity of certain liver enzymes. Similar but less marked increases in the liver enzyme activities were found in laboratory mice maintained on commercially prepared pet food without dieldrin treatment. The findings suggest that in dieldrin treated mice the development of liver tumors is not caused by increased enzyme activity. These enzymes are, however, able to transform harmless substances into carcinogens. The sensitivity of different mouse strains to foreign substances (dieldrin, lindane and DDT) was found to vary.

80-1355. Koenemann, H.; van Leeuwen, K. (Dep. Vet. Pharmacol. & Toxicol., Univ. Utrecht, NL-3572 BP Utrecht, The Netherlands) **Toxicokinetics in fish: accumulation and elimination of six chlorobenzenes by guppies.** *Chemosphere* 9(1): 3-19; 1980 (18 references).

Female guppies (*Poecilia reticulata*) were exposed to a standardized mixture of six chlorobenzenes (CBs): 1,4-dichlorobenzene (*p*-dichlorobenzene; 160 ng/ml), 1,2,3-trichlorobenzene (100 ng/ml), 1,3,5-trichlorobenzene (100 ng/ml), 1,2,3,5-tetrachlorobenzene (40 ng/ml), pentachlorobenzene (8 ng/ml), and hexachlorobenzene (4 ng/ml). After 19 days of exposure the fish were removed to fresh water and elimination of CBs was studied for 9 wk. At various intervals water samples and individual fish were analyzed for CBs by gas chromatography with a ^{63}Ni electron capture detector. A 2-compartment model was used to describe the kinetics of the CBs. Uptake and elimination rate constants and bioaccumulation were determined and correlated with log P_{ocr} (the partition coefficient of a substance between n-octanol and water). Results indicate that a parabolic curve, with an optimum at log $P_{ocr} = 5.4$, is apparently a better description of the relation of the uptake rate constant with log P_{ocr} than a straight line. Bioaccumulation increases with log P_{ocr}, until reaching an optimum value at log $P_{ocr} = 6.5$.

80-1356. Parlar, H.; Korte, F. (Inst. Okol. Chem., Ges. Strahl. & Umweltforsch. mbH Meunchen, D-8050 Freising-Attaching, BRD) **Photoumwandlungsprodukte der Chlordanderivate und ihre insektizide Wirksamkeit.**

[Photodegradation products of the chlordane derivatives and their insecticidal effectiveness.] *Chemosphere* 9(1): 55-58; 1980 (17 references) (German).

The toxicity of the phototransformation products of chlordane (1), *cis*-α-chlordane (2), and bromochlordane (3), obtained by irradiation at 227 nm, in *Musca domestica, Phaedon cochlessiae, Spodoptera littoralis, Aphis fabae,* and *Tetranychus urticae,* was studied. The determination of the toxicity indices with parathion as a reference (=100) showed that the toxicity indices of photochlordane, photo-*cis*-α-chlordane, and photobromochlordane were higher than the corresponding indices of the respective initial compounds. In *M. domestica* the toxicity index was 5 for compound 1, 29 for photochlordane, 39 for compound 2, 76 for photo-*cis*-α-chlordane, 20 for compound 3, and 100 for photobromochlordane.

80-1357. Baluja Marcos, G. (Inst. Quim. Org., CSIC, Madrid, Spain) **Evolucion quimica de herbicidas en el medio y contaminacion residual. [Chemical fate and residual contamination of herbicides in the environment.]** *Ciencias (Madrid)* 43(1): 18-23; 1978 (12 references) (Spanish).

Studies on the toxicity and persistence of pesticides are reviewed. The acute LD50 (mg/kg) in rats was found to be 7.5-8 for endrin, 32-67 for aldrin, 38-87 for dieldrin, 60-100 for heptachlor, 88-125 for lindane, 113-250 for DDT, 457-590 for chlordane, 6000 for methoxychlor, 1500 for 2,3,6-TBA, 3080 for atrazine, 3400 for diuron, 3600 for monuron, 5000 for propazine and simazine, 8200 for picloram, 11,000 for neburon, 375-865 for thiram, 395 for nabam, 1400 for ziram, 5200 for zineb, 7500 for maneb, 5700-17000 for ferbam, 9590 for benomyl, and 12,000 for quintozene. The persistence (time required for the disappearance of 95% of herbicides) ranged from less than 1 mo for barban to 1 yr for simazine and 2,3,6-TBA and to 18 mo for propazine and picloram. The persistence of insecticides ranged from 3 yr for aldrin to more than 6 yr for lindane and to 10 yr for DDT.

80-1358. Esher, R. J.; Wolfe, J. L.; Koch, R. B. (Biol. Sci. Dep., Mississippi State Univ., Mississippi State, MS 39762) **DDT and DDE inhibition of bat brain ATPase activities.** *Comp. Biochem. Physiol C* 65(1): 43-45; 1980 (20 references).

In vitro, bat brain ATPases were sensitive to DDT and DDE at concentrations considerably below environmental levels. DDT was a more effective ATPase inhibitor than was DDE by about three-fold. Mitochondrial Mg^{2+} ATPase was more sensitive than Na^+,K^+ or non-mitochondrial Mg^{2+} ATPase to both compounds. (Author abstract by permission)

80-1359. Singh, G. J. P.; Thornhill, R. A. (Dep. Zool. & Comp. Physiol., Univ. Birmingham, Birmingham B15 2TT, England) **The uptake and breakdown of dieldrin in *Blaberus discoidalis.*** *Comp. Biochem. Physiol C* 65(1): 47-52; 1980 (18 references).

The uptake and breakdown of [^{14}C] dieldrin was studied in *Blaberus discoidalis.* On a wet weight basis the uptake of an injected dose of [^{14}C]dieldrin was maximal in nerve cords followed by reproductive organs, gut and fat body. Five metabolites of [^{14}C] dieldrin were detected from *B. discoidalis.* The nature of the metabolites produced by different tissues analyzed varied. Apart from the formation of *cis*-aldrindiol and *trans*-aldrindiol, another metabolite was detected in the nervous system. The metabolism of dieldrin was inhibited by pre-treatment with sesamex. (Author abstract by permission)

80-1360. De Villar, M. I. P.; Zerba, E. N.; Wood, E.; De Licastro, S. (Lab. Entomotoxicol., CITEFA, Buenos Aires 1603, Argentina) **Neurogenesis and occurrence of cholinesterase in eggs of *Triatoma infestans.*** *Comp. Biochem. Physiol C* 65(1): 65-70; 1980 (24 references).

Eggs of *T. infestans* incubated at 30°C and 50% r.h. hatched in 15 days. The neurogenesis of *T. infestans* embryo was studied. The neuroblasts appeared on the third day and the nerve cells on the fourth day. The ontogenesis of cholinesterases was investigated. Activity was first detected on the fourth day coincidentally with the nerve cells appearance. The cholinesterases were characterized by butyrylcholinesterase and acetylcholinesterase. The oxygen analogs of several phosphorothionate insecticides were found to be potent inhibitors of the embryonic acetylcholinesterase. (Author abstract by permission)

80-1361. Pedersen, N. B.; Thormann, J.; Senning, A. (Dep. Occup. Med. & Dermatol., Inst. Chem., Marseilisborg Hosp., Univ. Aarhus, DK-8000 Aarhus C, Denmark) **Occupational contact allergy to bis-(4-chlorophenyl)-methyl chloride.** *Contact Dermatitis* 6(1): 56-56; 1980 (2 references).

A 21-yr-old male laboratory technician acquired acute dermatitis, including edema and vesicles of the face, wrists, and abdomen, after handling bis-(4-chlorophenyl)-methyl chloride. The chemical appeared to be highly allergenic; presence near the chemical and non-deliberate contact resulted in a second attack of eczema. This chemical is very similar in structure to DDT, and it is suggested that the chlorine atom in the α-position (benzylic) may be responsible for the allergenic reaction elicited.

80-1362. Clegg, D. J. (Bur. Chem. Saf., Health Prot. Branch, Health & Welfare Canada, Tunneys Pasture, Ottawa, Canada) **Animal reproduction and carcinogenicity studies in relation to human safety evaluation.** *Dev. Toxicol. Environ. Sci.* 4: 45-59; 1979 (120 references).

Animal reproduction and carcinogenicity studies are reviewed with respect to their use in evaluating the safety of toxic chemicals in humans. Approximately 70 three-generation reproduction studies involving pesticides were examined to determine the optimal length of reproduction studies. No adverse effects on reproduction were noted in 28 of these studies, however 33 studies indicated adverse effects prior to, or in, the F_{2a} litters. Reproductive disturbances occurred as early as F_{1a} with 80 mg/kg bromophos, 20 ppm carbophenothion, 500 ppm dicofol, 500 ppm diquat, 60 ppm leptophos or 30 ppm parathion. Reproductive disturbances occurred in F_{2a} with 3 ppm aldrin, 100 ppm acephate, 30 ppm carbofuran, 30 ppm chlorfenvinphos, 25 mg/kg DDT or 3 ppm dieldrin. Adverse effects due to captan and chlordane first appeared in the F_3 generation. Decreasing the required length of such studies to a two-generation, four litter study is suggested as a minimum requirement. Carcinogenicity testing work on DDT is summarized. DDT has failed to induce tumors in the hamster and monkey, and its carcinogenicity is rats is doubtful. DDT shows fairly uniform tumorigenicity in mice, however. The same is also noted for aldrin, dieldrin, chlordane, heptachlor, BHC isomers and chlorobenzilate, suggesting that the mouse is species specific in its response to organochlorine pesticides. The problems of extrapolating this species specificity, and problems of interpreting dose levels and *in utero* carcinogenicity studies, are discussed.

80-1363. Jansen, J. D. (Shell Int. Res. Maatschappij B.V., The Hague, The Netherlands) **The predictive value of tests for carcinogenic and mutagenic activity.** *Dev. Toxicol. Environ. Sci.* 4: 71-80; 1979 (71 references).

Mutagenic, carcinogenic, and epidemiological data are reviewed to identify those tests which are valuable in predicting a hazard in man. The recently increased use of cancer registries, genetic and cytogenetic research, and animal carcinogenicity studies as investigative tools is discussed. The validation process is also considered. To illustrate the validation process and provide some conclusions of predictability, the available carcinogenicity and mutagenicity data on some known human carcinogens, probable human carcinogens and mouse-specific carcinogens is presented. Among the known human carcinogens, all except one (diethylstilbesterol) are mutagenic, and all except two (benzene and arsenic) are carcinogenic in animal studies. The probable human carcinogens are carcinogenic in almost all species tested, and are mutagenic. Among the compounds shown to produce tumors of the liver and lung in mice but not in other species are dieldrin, DDT, heptachlor, chlorobenzilate and griseofulvin. None of these are shown by current evidence to present a carcinogenic hazard to man. It is concluded that the production of tumors in mice only is not an adequate criterion for prediction of a human hazard.

80-1364. Lu, F. C. (Res. & Teach. Cent. Toxicol., Sch. Med., Univ. Miami, Coral Gables, FL 33124) **Some qualitative and quantitative aspects in the interpretation of chemical carcinogenesis data.** *Dev. Toxicol. Environ. Sci.* 4: 139-146; 1979 (43 references).

The incidence of mouse hepatomas after chemical exposure is used as an example of the questionable value of predicting potential carcinogenicity in humans from positive results in laboratory animals. The organochlorine pesticides DDT, aldrin, and dieldrin increase the incidence of hepatoma in several strains of mice but evidence shows that it is unlikely that these compounds are carcinogenic in man. The finding of an analysis of data on liver cancer death rates in the general US population, which show an almost constant decrease in the total rate of liver cancer deaths from 1944 when DDT was introduced to 1927, are also used to question the correlation of positive laboratory results to cancer incidence in humans. It is suggested that future quantitative studies for determining threshold levels of carcinogenic compounds should take into consideration the factors known to affect individual responses to chemical carcinogens.

80-1365. Braun, W. H.; Blau, G. E.; Chenoweth, M. B. (Toxicol. Res. Lab., Health & Environ. Res., Dow Chemical USA, Midland, MI 48640) **The metabolism/pharmacokinetics of pentachlorophenol in man, and a comparison with the rat and monkey.** *Dev. Toxicol. Environ. Sci.* 4: 289-296; 1979 (5 references).

Four healthy male volunteers were used in a metabolic pharmacokinetic study of pentachlorophenol (PCP). All subjects ingested 0.1 mg Na-PCP/kg body wt and blood samples were collected prior to, and 1, 2, 4, 8, 12, 24, 36, 48, 72, 96, 120 and 144 hr after, ingestion and thereafter at 24 hr intervals until PCP levels were below the limits of detection. Urine and feces were also collected for 144 hr post-ingestion. All samples were analyzed for PCP and its metabolites by GC-MS. Pharmacokinetic parameters were obtained using a non-linear parameter estimation computer program. The dynamics of PCP absorption and elimination in humans could be described by a one compartment open-system model with first order absorption, enterohepatic recirculation, and first order elimination. The half-lives for absorption and elimination of PCP from plasma were 1.3 ± 0.4 hr and 30.2 ± 4.0 hr, respectively. The half-lives for elimination for PCP and PCP-glucuronide from urine were 22.1 ± 5.4 hr and 12.7 ± 5.4 hr, respectively. The model was compared with those previously constructed for PCP absorption and clearance in rats and monkeys to determine which would be better for extrapolation to humans. The rat model was considered to best cover the pertinent plasma kinetic parameters. The results from the human volunteers indicate that exposure to a time weighted average of 0.5 mg/m^3 will not cause adverse effects, even when the exposure is repetitive.

80-1366. Skalsky, H. L.; Lane, R. W.; Borelleca, J. (Dep. Pharmacol., Toxicol. Div., MCV Stn., Virginia Commonw. Univ., Richmond, VA 23298) **Excretion of carbaryl into saliva of the rat and its effect on cholinesterase.** *Dev. Toxicol. Environ. Sci.* 4: 349-358; 1979 (24 references).

Adult male Sprague-Dawley rats were used in studies designed to determine whether saliva analysis might be a suitable non-invasive technique for monitoring pesticide exposures. Rats were dosed with 0, 50, 100 or 200 mg carbaryl/kg, injected directly into the stomach, and blood, saliva and tear samples were collected at 0, 15, 30, 60, 90, 120, 240 and 360 min after dosing. Cholinesterase activities and protein concentrations were determined by TLC in saliva, tears, serum, urine and erythrocytes. The levels of carbaryl in saliva and plasma were parallel over time, with carbaryl reaching its highest peak in both fluids at 60 min after treatment. Salivary cholinesterase levels appeared to be roughly parallel to serum levels. In experiments using salivary gland slices, it was determined that the uptake and efflux of carbaryl within the submaxillary gland are not energy dependent. The data indicate that saliva may prove to be a useful diagnostic fluid.

80-1367. Abou-Donia, M. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of phenylphosphonothioate insecticides.** *Dev. Toxicol. Environ. Sci.* 4: 359-368; 1979 (14 references).

Adult hens (*Gallus domesticus*) were given po a single large dose or small daily doses of EPN or leptophos. The single doses were 200, 400, or 800 mg/kg leptophos and 25, 100, 300 and 500 mg/kg EPN. The daily doses were 1.0, 2.5, 10.0 and 20.0 mg leptophos/kg/day up to 60 days, and 0.1, 1.0, 5.0 and 10.0 mg EPN/kg/day up to 90 days. Plasma protein and plasma cholinesterase were determined, and histopathological examinations were carried out on the brain, spinal cord, sciatic, tibial and peroneal nerves. The single threshold doses below which no delayed neurotoxicity occurred were 25 mg/kg EPN and 180 mg/kg leptophos. When daily doses were given, the threshold doses were 0.1 mg/kg for EPN and 1.0 mg/kg for leptophos. The severity of the clinical condition was dose dependent; hens given small doses showed only ataxia while those given large doses progressed to paralysis and death. Histological changes included marked axon and myelin degeneration of the sciatic nerve and spinal cord, with less severe changes seen in the medulla. These results are concluded to be significant since EPN is a relatively stable compound and is still in wide use.

80-1368. Stickel, L. F.; Stickel, W. H.; McArthur, R. D.; Hughes, D. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Chlordane in birds: a study of lethal residues and loss rates.** *Dev. Toxicol. Environ. Sci.* 4: 387-396; 1979 (12 references).

Heptachlor, oxychlordane and chlordane were given in varying concentrations in the daily diet to cage conditioned wild birds. Heptachlor epoxide residues in brains of birds fed heptachlor were 9.2-27 ppm in dead birds and 2.7-7.8 ppm in survivors. Oxychlordane residues in brains of birds fed oxychlordane were 5.8-16 ppm in dead birds and 0.75-4.1 ppm in survivors. Mortality due to oxychlordane and heptachlor epoxide is estimated to begin at 5 and 8 ppm respectively. Chlordane levels were measured as amounts of derivatives; CH (hepatchlor epoxide), CO (oxychlordane), CN (*trans*-nonachlor), CC (compound C), CE (compound E) and *cis*-chlordane. Heptachlor epoxide and oxychlordane levels in chlordane dosed birds were around 28% of the levels found in birds dosed with oxychlordane and heptachlor epoxide directly. Chlordane toxicity to wild birds is suggested to be due to an additive or synergistic effect of its metabolites. The time to 50% mortality varied according to age and sex of birds, pesticide, and concentration of pesticide. Heptachlor at 50 ppm caused 50% mortality at 9 days in starling subadult males. Oxychlordane time to 50% mortality ranged from 57 days for 1.5 ppm to 3.25 days for 100 ppm. Chlordane was fed at 150 ppm, and time to 50% mortality was 6 or 7 days for all groups of birds tested. Loss rates of chlordane and its metabolites were observed after chlordane dosing. Oxychlordane, lost at a rate of 1%/day, was most persistent, followed by *trans*-nonachlor, heptachlor epoxide, compound C and compound E, in that order.

80-1369. Stickel, W. H.; Reichel, W. L.; Hughes, D. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Endrin in birds: lethal residues and secondary poisoning.** *Dev. Toxicol. Environ. Sci.* 4: 397-406; 1979 (11 references).

Endrin was fed to passerine birds (10 ppm/day), bald eagles (20 ppm/day) and mallard ducks (10 or 20 ppm/day). Signs of intoxication observed in passerines included a decrease in food consumption followed by muscle twitching and convulsions. A variety of behaviors were noted prior to death, ranging from lying quietly on the floor to flapping violently and crying out. Residues in passerine bird tissues ranged from 0.64 to 4.2 ppm. It was suggested that residues in the brain of $\geq$ 0.8 ppm endrin caused death, and $\leq$ 0.6 ppm allowed survival. Residues in mallards ranged from 0.54 (brain) to 1.9 ppm (liver). Bald eagles had endrin concentrations of 1.2 ppm in the brain and 2.5 ppm in the body. Endrin residue levels found in certain wild birds (bald eagles, white pelicans in the Northwest and pelicans in Louisiana) are also discussed. It is concluded that kills and secondary poisoning due to endrin do occur, and that efforts should be made to keep endrin out of the food chain.

80-1370. Deichmann, W. B.; MacDonald, W. E.; Frank, C. L. (Res. & Teach. Cent. Toxicol., Dep. Phar-

macol., Sch. Med., Univ. Miami, Coral Gables, FL 33124) **Effects of chronic aldrin feeding in two strains of female rats and a discussion on the risks of carcinogens in man.** *Dev. Toxicol. Environ. Sci.* 4: 407-413; 1979 (10 references).

Female Osborne-Mendel and Sprague-Dawley rats were used in a chronic aldrin feeding study. Animals were fed diets containing 0, 20, or 50 ppm aldrin, and were observed daily. Rats that appeared ill were sacrificed and specimens of all tumors, livers, kidneys, lungs and all organs showing gross pathological changes were examined. Aldrin at 20 ppm had little effect on survival, but at 50 ppm the survival rate was appreciably reduced. The feeding of aldrin in rats was not found to produce tumors of the liver. In Osborne-Mendel rats fed 20 ppm aldrin an elevated incidence of malignant lymphoreticular tumors was observed. However, the significance of this finding is questioned, and a virus related etiology is suggested.

80-1371. Astolfi, E.; Almeida, W. F.; Maccagno, A.; Gaeta, R. (Cent. Invest. & Asist. Toxicol., Buenos Aires, Argentina) **Estudio immunotoxicologico en plaguicidas. [Immunotoxicological study of pesticides.]** *Dev. Toxicol. Environ. Sci.* 4: 471-473; 1979 (4 references) (Spanish).

Immunotoxicological tests were performed on 41 factory workers exposed to DDT and 11 unexposed controls. The tests for rheumatoid factors, antimitochondrial antibodies, anti α-fetoprotein antibodies, and glomerular basal anti-membrane antibodies were negative in both groups. The antinuclear antibody test was positive in one control subject. Tests for antibodies to smooth muscles were positive in 5 of 41 and 2 of 11 cases, respectively. Tests for antibodies to striated muscles were positive in 13 of 41 and 5 of 11 cases. The differences in these tests were not significant statistically. The test for antibody to gastric parietal cells was positive in 5 of 41 and 0 of 11 cases, respectively. The findings indicate that DDT does not produce autoantibodies. The negative anti-α-fetoprotein antibody tests suggest that DDT does not have hepatic neoplasiogenic effects.

80-1372. Ni, S. (Univ. Georgia, Athens, GA) **Action and interaction of selected pesticides.** *Diss. Abstr. Int. B* 39(12): 5747-5748; 1979 (78 references).

The total level of inhibition of cholinesterase (ChE) in heads and in thoraces of house flies at the time of knockdown by vapor and injection treatment was comparable for chlorpyrifos-methyl and dichlorvos. Localized sites of inhibition of ChE in the thoracic nervous system were similar in the various treatments (injection, vapor, topical). However, differences in levels and localized sites of inhibition of ChE were noted in comparisons of these 2 insecticides applied by the same method. Inhibition and reappearance of AChE activity was observed by a histochemical technique in the perikaryal region of thoracic ganglia of house flies treated with TMPP, TEPP or TIPPP. The failure of actidione to prevent *in vivo* reappearance of AChE after inhibition suggests that synthesis of new AChE is not involved. The reappearance of AChE activity in the perikaryal region occurred at a rate independent of the dialkyl group of the OP and indicated that dephosphorylation of AChE did not occur. Actidione synergized the toxicity of certain organic pyrophosphate insecticides. *In vivo* protection of cholinesterase against inhibition by TEPP and TMPP was demonstrated in adult female crickets previously intoxicated by DDT, lindane, dieldrin or pyrethrin. Localized accumulation of acetylcholine at synapses in the nervous system of intoxicated crickets is suggested to play a major role in the observed protection of cholinesterase. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 79-14045)

80-1373. Butler, W. H. (Pharmaceut. Div., ICI, Macclesfield, Cheshire SK10 4TG, England) **Pesticide related lesions of the liver and their interpretation.** In: *Environmental Carcinogenesis.* Emmelot, P. and Kriek, E., eds. (Elsevier North Holland Biomedical Press: Amsterdam): pp. 193-201; 1979 (19 references).

Low grade liver injury with focal necrosis, bile duct proliferation and small areas of hyperplasia are observed in rats after long term treatment with organochlorine pesticides and phenobarbitone. Rat liver carcinogenesis was not suggested however. In mice treated with high levels of compounds for 6-9 mo hepatic lesions similar to those observed in rats were noted. The simple areas of focal nodular hyperplasia become large and distort the liver with continued treatment. These nodules are characterized as type A or non-neoplastic lesions of the liver. The association of different types of hepatic lesions observed after treatment with various organochlorine pesticides (heptachlor, chlordane, and mirex) and possible carcinogenicity is reviewed. Four modes of possible progression for simple type A nodules to adenoma or carcinoma are discussed.

80-1374. Dalela, R. C.; Rani, S.; Verma, S. R. (Pollut. Rel. Res. Lab., Post Grad. Dep. Zool., DAV College, Muzaffarnagar 251001, India) **Physiological stress induced by sublethal concentrations of phenol and pentachlorophenol in *Notopterus notopterus*: hepatic acid and alkaline phosphatases and succinic dehydrogenase.** *Environ. Pollut.* 21(2): 3-8; 1980 (21 references).

Studies were performed to determine the physiological stress caused by sublethal concentrations of phenol and pentachlorophenol (PCP). Healthy *Notopterus notopterus* were collected and acclimated to laboratory conditions. The fish were divided into groups and exposed to 90, 130, 264, and 662 μg phenol/l and 13.6, 20.4, 40.8 and 60.2 μg PCP/l. Fish were exposed for 10, 20 and 30

days, and solutions were changed every 24 hr. After exposure, the fish were sacrificed and their livers were homogenized and analyzed. Acid phosphatase activity decreased as PCP concentration and duration of exposure increased. Enzyme activity in controls at 10 days exposure was 0.068 mg P release/hr. In PCP treated fish 13.6 μg/l caused 41.1, 42.3, and 48.4% inhibition at 10, 20 and 30 days, respectively. At the highest dose enzyme activity was inhibited up to 71.1% at 30 days. Significant differences in alkaline phosphatase and succinic dehydrogenase activity levels were also noted at every concentration and length of exposure in the PCP treated animals.

80-1375. Boyle, T. P. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Effects of the aquatic herbicide 2,4-D DMA on the ecology of experimental ponds.** *Environ. Pollut.* 21(2): 35-49; 1980 (27 references).

The effects of the dimethylamine salt of 2,4-dichlorophenoxyacetic acid (2,4-D DMA) on the ecological variables associated with biological productivity at several trophic levels were studied. Field studies were carried out in 12 experimental ponds (mean area, 0.08 ha). Four ponds were left untreated, four were treated with 2,4-D DMA at a rate of 5 kg/ha, and four were treated at a rate of 10 kg 2,4-D DMA/ha. One pond in each group was stocked with 1490 bluegills *Lepomis macrochirus.* Water samples collected 3, 7, 14, 28, and 56 days after treatment were analyzed for 2,4-D residues. Water quality characteristics and several indices of biological productivity were determined for 16 wk after treatment. In the laboratory, the direct effects of 2,4-D on batch cultures of natural phytoplankton were tested. The 5 kg/ha treatment stimulated the growth of rooted macrophytes, and the 10 kg/ha level apparently increased fish growth. Statistical analysis of covariance by path analysis indicated that gross production in the treated ponds was more highly related to planktonic chlorophyll *a* and dissolved nutrients than in the untreated ponds. The laboratory studies showed that 2 mg 2,4-D DMA/l stimulated photosynthetic uptake of ^{14}C. It is suggested that low concentrations of herbicides in aquatic systems may alter the pattern of primary productivity and may stimulate the growth of rooted macrophytes and planktonic algae. The increased growth of fish may be directly due to 2,4-D or may be due to stimulation of phytoplankton productivity.

80-1376. Mehendale, H. M.; Matthews, H. B. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS) **Uptake, metabolism and biliary excretion of PCB's by isolated perfused rat liver.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 543-562; 1977 (28 references).

4-Chlorobiphenyl, 4,4′-dichlorobiphenyl, 2,4,5,2′,5′-pentachlorobiphenyl, and 2,4,5,2′,4′,5′-hexachlorobiphenyl were rapidly taken up by isolated perfused rat liver preparations. Biliary excretion of the compounds was measured after 4 hr of perfusion and found to be 48, 30, 20, and 1% of the total dose of each compound respectively. Less than 3% of the excreted compounds were unchanged parent compounds. The biliary excretion of 4-chlorobiphenyl was biphasic. When conjugated metabolites of 4-chlorobiphenyl were added to the perfusate of the isolated liver preparation, the excretion of these metabolites was monophasic, and corresponded to the slower period of excretion of the parent compound. Disappearance of 4-chlorobiphenyl from the perfusate was also biphasic. A discussion of the relationship between the degree of chlorination of the compound under study and its rates of metabolism and biliary excretion is offered.

80-1377. Sarker, A.; Ghosh, J. J. (Dep. Biochem., Univ. Coll. Sci., Calcutta, India) **Effect of DDT on the sub-cellular membrane-bound enzymes in different tissues of male and female rats.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* p. 563; 1977.

DDT was administered at 75% of the median lethal dose to male and female rats. Acetylcholinesterase activities of brain synaptosomal, microsomal and mitochondrial fractions were inhibited to the extent of 8-68% within 30 min while the Mg^{2+} ATPase activities in the same fractions were inhibited 20-48%. In the liver, microsomal Mg^{2+} ATPase and acetylcholinesterase activities were inhibited 40-48%. In the red cells the Mg^{2+} ATPase activity was inhibited 56% in males and 40% in female rats. In all the cases examined, the inhibitory effects of DDT were more prominent in the males than in female rats. However the inhibitory effects lasted for longer periods of time in the females than in male rats.

80-1378. Dikshith, T. S. S.; Datta, K. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Cytogenetic studies of endosulfan in male rats.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 578-589; 1977 (29 references).

Male albino rats were treated with known concentrations of endosulfan suspended in peanut oil daily for periods of 5 days by oral intubation. The concentrations used were 0, 11, 22, 36.6, and 55.0 mg/kg. After 5 or 10 days the animals were sacrificed. Results of chromosome studies indicate that endosulfan caused no significant cytogenetic effects at the given dose levels and for the periods of exposure in this study in either somatic or germinal cells. The three highest doses were found to be toxic; 7 of 8 animals in each of these groups died after 72 hr.

80-1379. Khanna, R. N.; Kohli, J. D. (Ind. Toxicol. Res. Cent., Lucknow, India) **Metabolism of**

chlorophenoxy herbicides in man. *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 590-599; 1977 (4 references).

Healthy human male volunteers were given 2, 3 or 5 mg 2,3,5-T/kg body wt or 5 mg 2,4-D/kg body wt in a gelatin capsule with water following a light breakfast. The volunteers remained under observation for the entire study period. Blood samples were taken at 1, 2, 7, 12, 32, 48, 56 and 168 hr after administration and urine samples were taken when voided during the 24 hr period immediately following dosing and at 24 hr intervals thereafter. Ingestion of 5 mg/kg of either compound caused no ill effects in the subjects and no changes in the various clinical and laboratory parameters monitored during the observation period. Both compounds were readily absorbed from the gastrointestinal tract with significant quantities being detected in the plasma 1 hr after ingestion. The highest concentrations for both compounds in the plasma were reached in 7-24 hr. 2,4-D and 2,4,5-T were detected in the urine as early as 2 hr after dosing. By 96 hr, > 75% of the 2,4-D was excreted. For 2,4,5-T, ~80% was excreted in the first 48 hr. Neither compound underwent any metabolic transformations. Pharmacokinetic analyses of the data were performed.

80-1380. Braid, P. E. (Clin. Enzymol. Sect., Environ. Health Dir., Ottawa, Ontario, Canada) **Factors influencing the toxicity of organophosphorus pesticides.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 600-607; 1977 (2 references).

Diazinon can decompose into tetraethylmonothiopyrophosphate, a highly toxic degradation product. A case study of several cattle dying after being sprayed with diazinon for tick and warble fly control is discussed. Investigation revealed that the chemical had been improperly stored for long periods of time and that moisture had invaded the containers, allowing the conversion of some of the diazinon to the more toxic decomposition product. The interaction of encephalomyocarditis (EMC) virus with DDT and fenitrothion, alone and in combination, is also examined. The percent survival of mice treated with EMC virus after dermal treatment with DDT + fenitrothion was about 40% after about 20 days. Those treated with either fenitrothion or DDT after EMC virus also had lower survival percentages. It is suggested that the spraying of DDT, phosphamidon and, most recently, fenitrothion in New Brunswick, Canada forests may be linked to the occurrence of Reye's Syndrome in that area.

80-1381. Datta, K. K.; Gupta, P. C.; Dikshith, T. S. S. (Ind. Toxicol. Res. Cent., Lucknow, India) **Effect of chlordane on the skin of male guinea pigs.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 608-611; 1977 (4 references).

ITRC bred male guinea pigs were treated dermally with chlordane at a dose level of 168 mg/kg for 90 days. None of the animals showed symptoms of insecticide poisoning at sacrifice. Microscopic examination of the skin revealed hyperkeratinization and cellular degenerative changes including vacuolization, and bi-, tri- and multinucleate conditions in some of the cells of malpighian layer. No significant changes were noted in blood and brain acetylcholinesterase.

80-1382. Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Distribution excretion and degradation of cholinesterase inhibitor malathion.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp.612-630; 1977 (15 references).

Adult hens were given oral doses of 262 and 394 mg malathion/kg. The compound was absorbed fairly rapidly from the gastrointestinal tract. Significant amounts were detected in the plasma and whole blood 30 min after ingestion. At both doses, the highest concentrations were found 6-8 hr after administration. The compound was rapidly degraded to its inactive metabolites and 90% was excreted within 24 hr. Chicks were fed malathion at 400-800 ppm for 1 mo. The concentration of the compound was maximum in the liver followed by the kidney, blood, heart, spleen, lung, intestine, muscle, bone, brain, and testes after 30 days. After treatment had been stopped for 10 days, the liver and kidney had less than 1 ppm malathion residues and no residues was detected in the other tissues. The compound appears to be rapidly absorbed, metabolized and excreted without any possible accumulation occurring.

80-1383. Dikshith, T. S. S.; Datta, K. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Comparative response of male rat to parathion and lindane individually and in a mixture.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 631-737; 1977 (9 references).

Male adult rats were given parathion at 2.6 mg/kg or lindane at 17.6 mg/kg or the combination of both daily for 90 days and were then sacrificed. Various changes were noted in the testes, including atrophy and massive necrosis of the seminiferous tubules combined with increased edema. The interstitial area was extensively enlarged and a proliferation of new blood vessels was noted. In lindane treated rats the tubules were filled with multinucleate giant cells. The combination of the two insecticides caused mild degenerative changes of the testes. However, the epididymis did not show any significant histological changes. A marked decrease was noted in the acetylcholinesterase activity in blood and brains of the experimental animals. Alterations were also noted in the activities of SDH, ATPase, and alkaline and acid phosphatases of the treated rats.

80-1384. Abraham, R.; Fulfa, J.; Mayes, B.; Coulston, F. (Inst. Comp. & Human Toxicol., Albany Med. Coll.,

Albany, NY) **Species differences in the hepatic response to insecticides.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 638; 1977.

The livers of monkeys, rats and mice were examined over a period of 3 yr to determine species response differences to mirex. Mirex was administered by stomach tube to rhesus monkeys at 5 and 20 ppm for 6 days/wk for up to 3 yr. Mice were given mirex at levels of 1 and 5 ppm and rats received 5 ppm. Acid phosphatase (AcPase) and glucose-6-phosphatase (G-6-Pase) activities were not changed in livers of mice receiving 1 ppm. G-6-Pase activity decreased in the centrilobular areas of mouse livers while AcPase activity increased with time in the 5 ppm group. Rat livers had no increased in AcPase activity and only a marginal loss in G-6-Pase activity. Monkey livers demonstrated no loss of G-6-Pase or activation of AcPase. The underlying feature in all livers was proliferation of smooth endoplasmic reticulum.

80-1385. Lewerenz, H. J.; Bleyl, D. W. R.; Plas, R.; Engst, R. (Cent. Inst. Nutr., Potsdam-Rehbrucke, DDR) **Toxicology of ethylenethiourea.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 639-660; 1977 (16 references).

The toxicology of the major degradation product of the ethylenebisdithiocarbamate fungicides, ethylenethiourea (ETU), is reviewed. ETU causes decreases in body weight, inhibits hepatic microsomal enzymes and produces histologic changes in the liver. The chemical is goitrogenic, carcinogenic, and teratogenic and it affects the suckling via the milk. It is suggested that the effects are dose related.

80-1386. Kujawa, M.; Engst, R.; Macholz, R. (Cent. Inst. Nutr., Acad. Sci., Potsdam-Rehbrucke, DDR) **On the metabolism of lindane.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 661-672; 1977.

The urine, feces, blood and important organs of lindane-treated rats were investigated for free metabolites and conjugates bound to β-glucuronides. The study indicates that lindane is degraded via the intermediates 2,3,4,5,6-pentachlorocyclohexane and two polychlorocyclohexanols mainly to pentachlorophenol (PCP) and tetrachlorophenol. The first degradation step equals a detoxification of 1:20, and the second step a toxification of 40:1. A degradation pathway is outlined. Glucuronation, conjugation to sulfuric acid, and SH-conjugation are to a large extent the means by which detoxification occur. In all organisms, the detoxification of lindane occurs according to this same general scheme. Investigations of lindane content in workers exposed to lindane revealed that the urine lindane concentrations decrease in workers exposed over long periods of time.

80-1387. Metivier, J. (Author address not given) **Synthesis of phosalone from naturally occurring benzoxazolones.** *Environ. Pollut. & Human Health. Proc. Int. Symp. Ind. Toxicol.:* pp. 673-687; 1977 (18 references).

Phosalone, an insecticide of moderate toxicity, has a low *in vitro* anticholinesterase (AChE) activity. During metabolism phosalone is changed at least partially into its thiolo derivative, oxophosalone. This oxidation product has 1000 times the AChE activity *in vitro* of the parent compound but the toxicity of the metabolite in rats is only 4 times greater. In plant tissues the quantity of oxophosalone found is generally 2% or less of the phosalone present at the same time. Oxophosalone yields the same metabolites as phosalone under the same conditions. Degradation pathways in the rat, in plants and in the soil are very similar and an overall degradation scheme for phosalone is proposed. Phosalone degrades to oxophosalone and 6-chlorobenzoxazolone, a non-toxic compound which upon further degradation will yield mainly 7-chloro-2-amino-phenoxazone.

80-1388. Bailey, J.; Knauf, V.; Mueller, W.; Hobson, W. (Int. Cent. Environ. Safety, Albany Med. Coll., Holloman AFB, NM 88330) **Transfer of hexachlorobenzene and polychlorinated biphenyls to nursing infant rhesus monkeys: enhanced toxicity.** *Environ. Res.* 21(1): 190-196; 1980 (22 references).

Clophen A-30 (CA-30 or PCB) or hexachlorobenzene (HCB) were given daily by gavage to lactating rhesus monkeys for either 30 days (CA-30, 16 mg/kg/day) or 60 days (HCB, 64 mg/kg/day) to 3 infant-mother pairs per compound. The extent to which the CA-30 or HCB were concentrated in the milk of the mothers and consequently transferred to the nursing infants was determined by measuring concentrations of both substances in milk and serum samples collected at frequent intervals. One mother and all the infants from each group were sacrificed and the tissue content of HCB or PCBs measured. Milk concentrations averaged 20 and 17 times higher than maternal serum levels for CA-30 and HCB treated monkeys, respectively. Infant serum levels were approximately 2-3 (PCBs) or 2-5 (HCB) fold higher than serum concentrations in their mothers. All of the HCB treated mothers remained healthy during dosing but one infant became moribund and was sacrificed on day 22, and another died on day 38. One CA-30 treated infant-mother pair was sacrificed on day 23 of the study when they developed severe symptoms of poisoning. In general tissue levels of both HCB and CA-30 were higher in infants than in their mothers. Both HCB and PCB were concentrated in the infant fat, bone marrow, and adrenals. These findings are consistent with the hypothesis that nursing infants are at greater risk than their mothers when the mothers are exposed to lipophilic toxins. (Author abstract by permission of Academic Press)

80-1389. Dubois-Krack, G.; Roberfroid, M.; Mercier, M. (Lab. Biotoxicol., Sch. Pharm., Univ. Louvain, B-1200 Brussels, Belgium) **Isolated hepatocytes and liver microsomes: a tool for the comparison between *in vivo* and *in vitro* metabolism of xenobiotics.** *Excerpta Med. Int. Congr. Ser.* 440: 47-49; 1978 (9 references).

Microsomal preparations and isolated hepatocytes from male Wistar rats were incubated with benzopyrene or aldrin in order to compare the catalytic properties of benzopyrene hydroxylase (BP) and aldrin epoxide synthetase (ald). Kinetic parameters of the BP preparations included V_{max} of 6700 ± 240 and 8.82 pmol/mm/mg and Km 2.36 ± 0.12 and 13.77 ± 3.4 × 10^{-6} M for microsomes and hepatocytes, respectively. Microsomal ald V_{max} values of 7.44 nmol dieldrin/mm/mg and Km 2.23 ± 0.28 × 10^{-6} M, respectively, and hepatocyte kinetic values of V_{max} 0.66 ± 0.006 nmol dieldrin/mm/mg and Km 3.08 × 10^{-6} M, respectively, were obtained.

80-1390. Taylor, J. S. (Dep. Dermatol., Cleveland Clinic Found. & Educ. Found., Cleveland, OH) **Occupational acne.** *Excerpta Med. Int. Congr. Ser.* 451: 525-527; 1979 (5 references).

The causative agents of occupational acne include petroleum and its derivatives, coal tar products, and halogenated and aromatic hydrocarbons. Among halogenated pesticides, contaminants of chlorophenol herbicides (2,4,5-T; PCP; etc) causing acneform eruptions include TCDD (2,3,7,8-tetrachloro-dibenzo dioxin), hexachlorodibenzo dioxin, and tetrachlorodibenzofuran. Contaminants of 2,4-dichloroaniline herbicides (propanil, diuron, etc) known to be acnegenic include tetrachloroazobenzenes. These chemicals produce chloracne, an extremely refractory form of acne venenata, often accompanied by serious systemic toxicity.

80-1391. Anonymous **Penncap M and bees. They can coexist.** *Farm Chem.* 143(2): 58, 60, 63; 1980.

The use of Penncap-M (microencapsulated methyl parathion) is discussed. Benefits of use listed include increased residual action, greater effectiveness, reduced mammalian toxicity, reduced phytotoxicity, reduced volatility, reduced migration in soil, reduced effects on parasitic and predatory insects, and cost effectiveness. Danger to non-target insects, such as honeybees, is also considered. An incident of bee kill in Michigan due to exposure to Penncap-M is mentioned. Reported bee kills suspected of being caused by Penncap-M are 17 in 1976, 11 in 1977, 9 in 1978, and 7 in 1979. It is suggested that bee kills are due to use of Penncap-M contrary to label instructions, and that the decrease in bee kills is the results of efforts to educate pesticide users. The label specifically states that Pencapp-M should not be applied, or allowed to drift, to weeds in bloom on which an economically significant number of bees are actively foraging.

80-1392. Meneguz, A.; Michalek, H. (Lab. Farmacol., Ist. Super. Sanita, Rome, Italy) **Poisoning by diisopropylfluorophosphate (DFP) in mice: central cholinergic systems involved in the antidotal action of obidoxime and diazepam.** *Farmaco. Ed. Prat.* 34(12): 523-531; 1979 (30 references).

Male mice from an outbred White Swiss strain were injected with various doses of the insecticide DFP. Diazepam (5 mg/kg ip) was given as a protective agent. An additive effect was noted when both diazepam and obidoxime were used as protective agents against the toxic effects of DFP. After studying each compound individually it was concluded that the attenuation by diazepam of DFP toxicity in mice, independent of the recognized anticonvulsant action of the drug, may be related to a protective effect on brain soluble ChE against DFP induced inhibition. It is also noted that diazepam may interfere with the role of endogenous ACh in the production of seizure by inhibiting neurotransmitter release.

80-1393. Ji, S.; Lemasters, J. J.; Thurman, R. G. (Dep. Pharmacol., Univ. North Carolina, Chapel Hill, NC 27514) **Metabolism of 7-ethoxycoumarin by the perfused rat liver.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 306; 1980.

7-Ethoxycoumarin (EC) is converted to fluorescent 7-hydroxycoumarin (HC) by microsomal mixed-function oxidases; the HC formed is subsequently conjugated to produce nonfluorescent glucuronide and sulfate derivatives. The metabolism of EC and HC was studied in the rat liver perfused with Krebs-Henseleit buffer at 37°. The effluent was analyzed for free HC and glucuronide and sulfate conjugates by fluorometry. The maximal rate of EC *o*-deethylation was 2.3 μmol/g/hr with an apparent K_m of 6 μM. The *o*-deethylation rate was independent of portal PO_2 in the range of 675-320 torr. When HC was infused into the liver at 20 μM, the rate of conjugation was 5.1 μmol/g/hr. The extent of conjugation of infused HC was 100% at [HC] lower than 15 μM and 55% at [HC] = 25 μM. The conjugation rate was inhibited up to 40% when the portal PO_2 was lowered from 670 to 329 torr. In contrast, this reduction in portal PO_2 affected neither the rate of mixed-function oxidation nor the tissue pyridine nucleotide redox state. Tissue anoxia caused selective inhibition of sulfation with little effect on glucuronidation. The nature of conjugation of HC was predominantly glucuronidation (55-70%) when HC was supplied to the liver exogenously; on the other hand, when HC was generated in the liver from EC, sulfation predominated (up to 90%). This observation suggests that the sulfotransferase is functionally more closely associated with the mixed-function oxidase than the UDP-glucuronyl transferase. [Abstract 210 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1394. Joy, R. M.; Stark, L. G.; Peterson, S. L.; Bowyer, J. F. (Dep. Pharmacol., Univ. California, Davis,

CA 95616) **Dieldrin facilitates kindling development in the rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 309; 1980.

Previous studies in our laboratory have demonstrated that dieldrin can in its own right evoke kindling upon iterative exposure. In this study we examine the capacity of dieldrin, after single or during continuous administration, to modify kindling evoked by amygdaloid stimulation. Kindling was evaluated in rats implanted with electrodes in the amygdala for stimulation and recording during chronic dieldrin administration. Rats given 2.5 mg/kg every other day required fewer stimulations to reach a fully kindled state and exhibited more severe convulsions during the acquisition of the response. Rats given 5 mg/kg every other day took fewer stimulations, exhibited more severe convulsions and had longer after discharges during acquisition than did controls. In other experiments it was demonstrated that a single administration of dieldrin, given 1 wk before the start of kindling, facilitated the subsequent development of kindling. Rats exposed to dieldrin exhibited longer and more severe seizures during the acquisition phase and during the fully kindled state. The various data indicate that dieldrin can predispose the brain to at least one kind of epileptogenic process. Both concurrent and longer term alterations occur which are expressed primarily as increases in the rate of acquisition of the kindled seizure. [Abstract 225 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1395. Rice, D. C.; Gilbert, S. G. (Dep. Health & Welfare, Health Prot. Branch, Ottawa, Ontario K1A 0LZ, Canada) **Early chronic exposure to methylmercury in monkeys: effects on spatial vision.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 396; 1980.

Monkeys (*Macaca fascicularis*) were dosed orally with methylmercury from day 1 of life. Blood total mercury levels peaked at 1.4 ppm when the infants were approximately 200 days of age, and declined thereafter to a stable level of 0.8 ppm. No obvious signs of methylmercury poisoning were observed; food intake and growth curves, hematology, and routine clinical and neurological examinations were normal. Monkeys had no or slight refractive errors; retina and optic nerve appeared normal. When these monkeys (4 treated and 3 control) were 3-4 yr of age, visual function was assessed by determination of contrast sensitivity function at a luminance in the photopic range. Contrast sensitivity functions were observed behaviorally with stationary sinusoidal grating patterns using a forced choice procedure. Functions generated by control monkeys were compatible to those generated by humans using the same procedures and apparatus. Of the 4 methylmercury treated monkeys, one showed a severe deficit at middle and high spatial frequencies and a second showed a high spatial frequency deficit. This is suggestive of a loss of foveal vision, whereas loss of peripheral vision has been observed in human adults exposed to methylmercury. Peripheral (rod) visual function is currently being assessed by low luminance (scoptopic) contrast sensitivity. [Abstract 678 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1396. McGloin, J. B.; Kubb, M. A.; Spangler, N. L. (T. R. Evans Res. Cent., Diamond Shamrock Corp., Painesville, OH 44077) **Comparative effects of several carbamate insecticides in two strains of mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 410; 1980.

Studies were conducted using 2 strains of mice to determine if a strain difference exists in sensitivity to cholinesterase (ChE) inhibition by carbamates commercially used as insecticides. The animals tested were Swiss-derived outbred laboratory mice, *i.e.* CD-1 and ND-4 male mice. Following oral dosing with the carbamates, the animals were observed for signs of neurological deficit (NTD-50) at 33 min, using the rotorod method. A 24 hr observation of acute lethality was also recorded. *In vivo*, the carbamates, monocrotophos, methomyl, and carbofuran, produced a different NTD-50 and lethality value in the ND-4 and CD-1 mice. This difference was apparent at both the 33 min and 24 hr observations. *In vitro*, a 50% inhibition of ChE (I50) by the carbamates was obtained using plasma from each strain. The I50 values were compared using electric eel ChE as a standard. ChE activity was similar in the plasma of the 2 strains of mice not treated with the carbamates, but after treatment with the carbamates, the I50 value determined for the CD-1 mice was different than that for the ND-4 mice. A difference in isoenzyme ratios was examined to determine the mechanism for the variation in the sensitivity of the mice to carbamates. The results demonstrate a strain difference in the sensitivity of ND-4 and CD-1 male mice to carbamates. [Abstract 755 of the annual meeting to the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1397. Bishop, W. H.; Henke, L.; Christopher, J. P.; Miller, D. B. (Med. Res. Inst., US Navy, Bethesda, MD 20014) **Photodestruction of acetylcholinesterase.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 410; 1980.

Ultraviolet radiation of 11S acetylcholinesterase produces a loss of tryptophane fluorescence which is best described as the sum of 2 separable first order processes, one much more rapid than the other. In addition, the enzyme undergoes an all or none inactivation that is monotonically first order. Simultaneous with activity loss, photoscission takes place and results in a molecular weight drop of 1×10^5 daltons and this decrease is first order with a rate constant identical to that for enzymatic inactivation. These processes are accompanied by apparent conformational changes as evidenced by circular dichroic and difference absorption spectra. The photochemical inactivation efficiency of incident light is unity when corrected for the wavelength dependence of fluorescence excitation which is consistent with an efficient Foerster resonance

transfer of energy among the aromatic chromophores. The extreme sensitivity of acetylcholinesterase to photodestruction upon photon absorption and the several events which follow it suggest that these findings might be a basis for a useful molecular probe of the structure of this enzyme. [Abstract 756 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1398. Baker, T.; Lowndes, H. E. (Dep. Pharmacol., Cornell Univ. Med. Coll., New York, NY) **Phenylmethylsulfonyl fluoride (PMSF) protection in delayed organophosphorus neuropathy.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 416; 1980 (3 references).

A delayed neuropathy of peripheral nerves in a single hindlimb of the cat develop after a single ia 2 mg/kg injection of DFP. In the delayed peripheral neuropathy, the capacity of soleus alpha motor nerve terminals to generate stimulus-bound repetition is maximally suppressed at 21 days after DFP exposure, although nerve conduction velocities and single impulse transmission are normal. Histologically the motor nerve terminals evidence marked degeneration changes. At this time the animals clinically demonstrate a peculiar high-foot step gait in the neuropathic leg. At 21 days after DFP exposure, the primary and secondary spindle frequencies of firing at various lengths of stretch are decreased. Thresholds for both primary and secondary spindles are elevated. Treatment with PMSF 24 hr before the DFP injection protects the DFP treated cats from the delayed neuropathy. No clinical neurotoxic signs are observed at 21 days after DFP. Stimulus-bound repetition capacity of soleus alpha motor nerve terminals is still present at this time and its incidence is much greater than that seen in the delayed neuropathic cat. [Abstract 788 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1399. Wudl, L.; Taylor, B. A.; Wood, A. W. (Hoffmann La Roche Inc., Nutley, NJ 07110) **Metabolism of coumarin in C57BL/6J and B6.L-*Coh*^{a} (congenic) mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 523; 1980 (1 reference).

The marked strain difference in the cytochrome P-450 dependent hydroxylation of coumarin (C) to 7-hydroxycoumarin (7-HC) in the mouse is principally controlled by a single gene locus on mouse chromosome 7. A congenic strain has been obtained by transferring the high coumarin hydroxylase allele from C57L/J mice to the genetic background of the B6 mouse. Hepatic microsomes from control and phenobarbital (PB) pretreated congenic and C57L/J mice metabolized up to 6 times as much C to 7-HC as the microsomes from B6 mice. In contrast, rates of microsomal hydroxylation at positions 3, 5, 6 and 8 of C were comparable in B6 and congenic mice. The percent of total C metabolites at positions 3, 5, 6, 7 and 8 with microsomes from untreated B6 mice was 39, 14, 16, 8 and 25%, respectively, and with microsomes from untreated congenic mice was 32, 10, 13, 22 and 23%, respectively. PB pretreatment induced microsomal cytochrome P450 2.5-fold in both strains but total C metabolism per nmol of P450 was not induced in B6 mice. Modest increases (1.4-fold) in hydroxylation at positions 3 and 7 were balanced by decreased hydroxylation at positions 6 (0.3-fold) and 8 (0.4-fold). In congenic mice PB pretreatment increased hydroxylation at positions 3 (2-fold) and 7 (3-fold) accounting for a total increase in C metabolism, per nmol of P450, of 1.6-fold. *In vivo* metabolism of C paralleled the *in vitro* results. Urinary levels of 7-HC after injection of C were 5- to 10-fold higher in congenic mice while 3-HC and 8-HC were excreted in comparable amounts in the two strains. [Abstract 1353 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1400. Olajos, E.; Kimmerle, G.; Rosenblum, I. (ICHT, Albany Med. Coll., Albany, NY 12208) **The copper mobilizing effect of various neurotoxic organophosphates.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 524; 1980.

Some organophosphates produce delayed neurotoxicity in man which may be modeled experimentally in the adult hen. Kimmerle and Loser reported a relationship between delayed neurotoxicity and elevated serum Cu and ceruloplasmin levels in hens treated with neurotoxic OP compounds. The aim of the present study was to compare the copper mobilizing effect of several OP compounds: tri-*o*-cresyl phosphate (TOCP); diisopropyl fluorophosphate (DFP); 2-chloro-diethyl (2,2 dichlorovinyl) phosphate (Bayer 111); and *O,O*-diethyl-*O*-(*p*-nitrophenyl) phosphorothioate (parathion). The changes in Cu levels could provide a mechanism for explaining neuro-pathologic changes caused by neurotoxic OP compounds. Atropinized adult hens were given oral doses of the above. The Cu levels in serum, brain, liver, and kidney were determined by atomic absorption spectroscopy. Serum Cu levels were increased 24 hr after a single dose of neurotoxic OP compound (37-54 μg/100 ml) compared to controls (30-34 μg/100 ml). Of the organophosphates studied only Bayer III was shown to elevate brain Cu levels (24-36 μg/g dry wt versus 20 μg/g dry wt for controls) at 24 hr and 7 days after dosing. These observations suggest that changes in tissue distribution of copper may play an important role in relation to the development of delayed neurotoxicity. [Abstract 1356 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1401. Evers, W. D.; Hook, J. B.; Bond, J. T. (Michigan State Univ., East Lansing, MI 48824) **Diet and paraquat (PQ) toxicity in mice: altered PQ organ distribution and effect of dietary protein or lipid on PQ toxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 524; 1980 (1 reference).

Toxicity of the herbicide paraquat is increased in animals fed a purified diet when compared to animals fed a cereal-based closed formula diet. Male ICR mice, 28 days old, were fed a purified diet of Wayne Lab Blox for 2 wk and then given an ip injection of ^{14}C-PQ (33 mg/kg). Concentration of PQ in liver, lung, kidney, heart, plasma and urine was examined from 1 to 48 hr after injection. Higher concentrations of PQ were observed in liver, kidney, heart and plasma from 3-12 hr after injection, while lung and urine concentrations were unchanged. The purified diet was also modified either by replacing the casein with egg white solids or increasing the lipid content from 3% to 15%. After 2 wk on these diets mice were injected with PQ. Mice fed egg white protein had longer survival times although 7-day percent survival was not different compared to mice fed casein. Changes in dietary lipid did not alter the toxicity of PQ. The higher organ levels of PQ found within 12 hr after injection suggest that the affected organs may sustain greater damage which results in the decreased survival time and percent survival that is observed in the animals fed the purified diet. While the dietary constituent that is responsible for the difference in PQ toxicity does not appear to be in the lipid portion, the type of protein used may be a factor. [Abstract 1360 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1402. Kinnes, C. G.; Abdo, K. M.; Abou-Donia, M. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Toxicokinetics and metabolism of a topically applied dose of *O*-ethyl *O*-4-nitrophenyl phenylphosphonothioate (EPN) in cats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 525; 1980.

A single topical 20 mg/kg dose (5.62 μCi/animal) of ^{14}C labeled EPN (*O*-ethyl *O*4-nitrophenyl [^{14}C] phenylphosphonothioate) in acetone solution was administered on the preshaved skin on the back of the neck of cats. The application site was not protected. Three treated cats were killed at each time interval: 0.5, 2, 4, 8 and 12 days. A total of 30% of the applied dose was absorbed through the skin during the experiment. Most of the radioactivity was excreted in the urine (21% of the applied dose). Only 3% of ^{14}C was recovered in the feces. No radioactivity was detected in expired CO_2. Radioactivity in tissue reached a peak of 21% of the dose after 2 days of administration; radioactivity decreased to 5% (24% of peak value) after 12 days. Highest ^{14}C content was present in the muscle followed by the skin and the liver. Brain, spinal cord and peripheral nerves, which are affected by the neurotoxicity of EPN, were among tissues containing the smallest amount of radioactivity throughout the experiment. Metabolites in liver, nerve tissues and excreta were identified with a system combining sequential thin layer chromatography, high pressure liquid chromatography and mass spectrometry. [Abstract 1363 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1403. Tuey, D. B.; James, M. O. (NIEHS, Research Triangle Park, NC 27709) **Compartmental analysis of 2,4-dichlorophenoxyacetic acid pharmacokinetics in spiny lobster.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 525; 1980.

Classical compartmental analysis was used to characterize the disposition of 2,4-dichlorophenoxyacetic acid (2,4-D) in the spiny lobster *Panulirus argus* according to a physiological pharmacokinetic model. Animals received a 10 mg/kg dose of ^{14}C-labeled acid by injection into the pericardial sinus and were then sacrificed at various times and the tissue distribution of ^{14}C was determined. Selected tissues were analyzed for metabolites. A mathematical three compartment model was fit to the experimental data. Biological interpretation of all model parameters was possible in terms of tissue volumes, blood flow, tissue/blood distribution ratios, metabolism, and clearance rates for a flow-limited physiological pharmaco-kinetic model. 2,4-D half-life in lobster was 6-8 hr. The model-derived 2,4-D hepatopancreas/hemolymph ratio was 2.0 *vs* 0.7-4.0 experimentally. Clearance of 2,4-D in hemolymph *via* green gland was 3-7 times greater than the rate of metabolism in hepatopancreas. The results show how the relative importance of competitive disposition pathways can be quantitated by compartmental analysis. [Abstract 1364 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1404. Carmines, E. L.; Carchman, R. A.; Borzelleca, J. F. (Dep. Pharmacol., Med. Coll. Virginia, Richmond, VA 23298) **Analysis of the interactions between paraquat and DNA.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 545; 1980.

It has previously been reported that paraquat (PQ) inhibits DNA synthesis *in vivo* and *in vitro*. We have investigated the nature of the interaction of PQ with DNA. Oxidized and reduced PQ had no effect on the melting point of calf thymus DNA. The ultraviolet spectrum of a mixture of DNA and PQ indicated an interaction. The nature of the interaction was independent of the oxidation state of PQ. In addition DNA did not reduce PQ as measured by absorbance in the visible range. The effect of PQ on the enzyme DNA polymerase was investigated. When PQ (10^{-6} to 10^{-3} *M*) was incubated with activated DNA prior to the addition of the polymerase an inhibition of DNA synthesis was observed (15 to 90% of control). When PQ was added after the polymerase had been incubated with DNA, no inhibition of enzyme activity was observed. These experiments indicate that PQ prevented the binding of the polymerase to DNA. These results suggest that the molecular mechanism of inhibition of cell growth and DNA synthesis may be due to the inhibition of DNA polymerase. [Abstract 1475 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1405. Schrankel, K. R.; Hsia, M. T. S. (Univ. Wisconsin, Madison, WI 53706) **Hepatic histopathology of 3,3′,4,4′-tetrachloroazobenzene in rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 546; 1980.

3,3′,4,4′-Tetrachloroazobenzene (TCAB) is an unwanted contaminant in the manufacturing of 3,4-dichloroaniline derived herbicides. TCAB has been recently implicated as the causative agent of chloracne among chemical plant workers. The carcinogenic potential of TCAB was demonstrated by its ability to transform C3H/10 T0.5 mouse embryo fibroblasts and induce unscheduled DNA synthesis in isolated rat hepatocytes. The hepatotoxicity of TCAB was examined in short term experiments. Sprague Dawley rats were given ip injections of TCAB at doses of 25 mg/kg. Livers were removed and processed for histopathological examinations using light and electron microscopy. The hepatocytes were generally enlarged having abundant granular cytoplasm. Numerous vacuoles were found in the cytoplasmic region. The hepatic mitotic index for the experimental animals was approximately 5.5 times greater than control animals, thus indicative of liver damage. A proliferation of smooth endoplasmic reticulum was observed in addition to the occurrence of concentric membrane arrays. Results obtained in this study coupled with our previous data indicate that TCAB must be considered an occupational health hazard. [Abstract 1478 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1406. Marco, L. A.; Perlitz, M. K. (VA Hosp., Charleston, SC 29401) **Mercury depolarization of crab muscle: protection by sulfhydryl and selenium containing agents.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 556; 1980.

The resting membrane potentials (RMP) of muscle fibers of the extensor muscle of the carpopodite of walking legs in blue crabs were measured *in vitro* with intracellular micropipettes and conventional recording equipment. In normal medium, RMP averaged -80 mV ± 5 (SEM). Addition of 100 μM $HgCl_2$ depolarized fibers to 6-12% of control RMP at 60 min of exposure. Cysteine and cystine provided nearly 100% protectiveness at concentrations of 80 and 200 μM, respectively. Methionine and seleno-dl-methionine up to 1000 and 800 μM respectively exhibited little capacity to prevent Hg-induced depolarization, with RMP of 13 and 23% of control, respectively, at 60 min of Hg exposure. Compared with other agents tested recently, the sequence from most to least protectiveness against 100 μM concentrations of Hg is as follows: cysteine > cystine > penicillamine > sodium selenite > seleno-dl-methionine > methionine. The protective action of these compounds was enhanced further in a $CaCl_2$-rich medium (60 mM versus 20 mM in normal bath), but high Ca^{2+} did not, *per se*, prevent severe Hg-induced depolarization. It is suggested that the primary mechanism of protective action may be binding of Hg to available sulfhydryl (-SH) groups in some of these agents (cysteine, cystine, penicillamine) and secondarily binding of selenium to Hg or to membrane -SH groups, thus preventing Hg from acting directly on membrane -SH groups. [Abstract 1532 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1407. Combs, G. F., Jr.; Peterson, F. J. (Cornell Univ., Ithaca, NY 14853) **Protection from paraquat toxicity by dietary selenium in the chick.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 556; 1980.

Acute paraquat (PQ) toxicity was reduced by dietary selenium (Se) but not be vitamin E (VE) in the chick. PQ given orally to 10-day-old females fed a low Se (< 0.02 ppm), VE-free semi-purified diet supplemented with Se (0.10 ppm as Na_2SeO_3) and VE (100 IU/kg as d,l-a-tocopheryl acetate) had an LD50 of 442 ± 62 mg/kg. Omission of VE did not affect PQ toxicity, but increased non-protein thiols (npSH) 22-33% in liver but not in heart, kidney, lung or blood in 5 hr. Se reduced hepatic npSH 18 or 25% in the presence or absence of PQ. PQ increased protein thiols (SH/mg; pSH) in the liver (51%) and lung (43%) in the absence of Se which independently increased pSH in those tissues. *In vitro* O_2 uptake by liver or lung microsomes was 7.08 ± 0.42 or 1.82 ± 0.16 nmole/mg-min and was stimulated 27 or 16 fold by 1 mM PQ. PQ-stimulated O_2 uptake was inhibited by 10 or 17% by superoxide dismutase (SOD), 41 or 42% by catalase (CAT), and 47 or 54% by SOD + CAT. VE-Se-deficient chicks evolved 2.5 times as much ethane as controls; PQ did not stimulate ethane evolution in either group. These results indicate that PQ toxicity may result from the metabolic production of reactive oxygen, protection from which is a Se-dependent process not involving lipid peroxidation. [Abstract 1533 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1408. Kim, S. J.; Roberts, J. F. (North Carolina State Univ., Raleigh, NC 27650) **Lysozyme activity in paraquat-treated mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 612; 1980.

Concentrations of serum lysozyme (LZM) were measured in 38 ICR *Mus musculus*, 6-8 wk old, treated with paraquat (PQ), 30 mg/kg body wt, ip. Identical measurements were made on 17 normal saline-treated mice for controls. The levels of LZM in the PQ-treated group showed significant increases ($p < 0.001$) versus controls after 24, 48, 72, and 96 hr (mean ± SE: 16.5 ± 1.34, 14.2 ± 1.58, 13.1 ± 1.88, 12.1 ± 1.63, versus 7.6 ± 0.36 μg/ml). Within the PQ group, the survivors (30.6%) had an increasing trend of LZM level after 48 hr while the dead mice had a decreasing trend. The survivors had hemoglobin and hematocrit levels (13.2 ± 0.57g%, 41.7 ± 2.41%) lower than those of the dead group (16.7 ± 0.75g%, 51.3 ± 2.60%) during the experimental period. These results indicated that the LZM activity responded to the acute insult of PQ, possibly as a modulating reaction against the

generation of toxic free radicals of PQ, reaching a peak level after 24 hr of PQ challenge. [Abstract 1843 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1409. Nelson, J. C.; Wong, L.; Mower, H. F. (Univ. Hawaii, Honolulu, HI 96822) **Mutagenicity of *N*-nitroso derivatives of carbofuran and its toxic metabolites.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 620; 1980.

Many nitrosamide compounds are direct acting mutagens and carcinogens. Conversion of carbamate pesticides to nitroso derivatives occurs readily in the presence of sodium nitrite under acidic conditions. Carbofuran (2,3-dihydro-2,2-dimethyl- 7-benzofuranyl methylcarbamate; insecticide, nematicide) is metabolically oxidized to 2 less toxic forms, 3-hydroxy and 3-keto carbofuran. The *N*-nitroso derivatives of carbofuran and its metabolites were synthesized. The maximum extent of nitrosation was found to occur within the initial 15 min of the reaction. Further incubation produced several different products and reduced the yield of the nitroso form. Products of the reaction were obtained by extraction, identified by thin layer chromatography and purified by silica gel column chromatography. All 3 nitroso derivatives reacted positively with Gries reagent and gave the characteristic triplet absorption spectra (387, 402, 420 nm). Structural confirmation was by IR, NMR and mass spectroscopy. Mutagenicity was determined by using the Ames Assay method with *Salmonella typhimurium* strains TA98 and TA100. Nitroso carbofuran gave a mutagenicity ratio of 10 at less than 2 μg/plate. The nitroso forms of 3-keto and 3-hydroxy metabolites gave the same ratio at 15 and 60 fold higher concentrations, respectively. The results suggest that metabolic oxidation of this compound could produce forms that are less active mutagens. [Abstract 1883 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1410. Siraj, M. Y.; Hayes, A. W.; Berndt, W. O.; WiHiams, W. L. (Dep. Pharm. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Effect of citrinin (CT) on the hepatic mixed function oxidase (MFO) in male rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 620; 1980.

The effect of CT (antimycin, antibiotic fungicide) on the MFO in male rats was examined. CT (50 mg/kg) was administered (ip) to animals pretreated with saline (SA; 5%), phenobarbital (PB; 40 mg/kg, twice daily for 4 days), 3-methylcholanthrene (3MC; 20 mg/kg, once daily for 2 days) or SKF-525A (SKF; 30 mg/kg, 3 doses at 4 hr intervals). Animals were sacrificed 72 hr after the CT dose. Levels of cytochromes P450 and b_5, oxidations of hexobarbital (HB), ethylmorphine (EM) and aniline (AN), enzyme activities of NADPH-dehydrogenase (DH) and NADPH-cytochrome *c* reductase (RD) and interaction spectra for P450-HB and P450-AN were determined in the hepatic microsomal fraction. CT inhibited (34%) P450 in the SA pretreated animals but did not completely reverse P450 induction in PB or 3MC animals. CT selectively inhibited oxidation of type I substrates. When enzyme activity was expressed on a protein basis, CT inhibited HB (66, 28, 71, and 38%) and EM (71, 36, 76, and 44%) in animals pretreated with SA, PB, 3MC or SKF, respectively. Similar inhibition also was observed in HB (46, 47, 78 or 41%) and in EM (55, 54, 82 and 48%) when enzyme activity was expressed on a P450 basis. CT also inhibited (37%) the P450-HB binding; however, it had no effect on AN hydroxylation of P450-AN binding. CT did not inhibit proteins, b_5, DH or RD. CT may have a direct effect on the oxidation of type I substrates which may involve disruption of the apoenzymes. [Abstract 1885 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1411. Alkadhi, K. A.; Taha, M. N. (Coll. Med., Al Mustansirya Univ., Baghdad, Iraq) **Effects of methylmercuric chloride on the superior cervical ganglion of the rabbit.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 622; 1980 (1 reference).

Methylmercuric chloride (mHg) was tested on the compound action potentials recorded from isolated superior cervical ganglion (SCG) and cervical sympathetic trunk (CST). mHg (0.02 m*M*; 5×10^{-6} g/ml) progressively and completely blocked the action potential of the CST in less than 20 min. There was no significant differential blocking effect of mHg on the 2 major spikes S_1 and S_2 of the action potential. The development of block in the SCG was much slower (about 2 hr for complete block). Rise and decay times of the action potentials of the CST and SCG were unaffected by mHg when measured at 50% block. Conduction velocities of the 2 major fiber groups in the CST were also unchanged. Removal of mHg from the bath stopped the progressive decrease of action potential in both preparations, but no recovery was observed. Three-fold increase in calcium concentration (6.6 m*M*) in the bathing solution slightly delayed the decrease in the action potential from the CST. In the SCG, high calcium concentration caused considerable delay in the progress of transmission failure caused by mHg. The results suggest a possible block of calcium action at the ganglion by mHg as proposed by Manalis and Cooper. [Abstract 1894 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1412. Staatz, C. G.; Bloom, A. S.; Lech, J. J. (Dep. Pharmacol. & Toxicol., Med. Coll. Wisconsin, Milwaukee, WI 53226) **A pharmacological analysis of mechanisms of permethrin neurotoxicity in mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 624; 1980.

Permethrin, a synthetic derivative of the pyrethrin based insecticides, produces a syndrome consisting of mild

hyperthermia, hyper-responsiveness to external stimuli, hyperexcitability, tremors and convulsions which may result in death (ED50 for convulsions = 35.8 mg/kg iv). Intracerebroventricular injections of 2.5 μg/mouse (~ 100 μg/kg) produced identical symptoms, demonstrating that this syndrome is central in origin. To investigate the mechanism of action of this compound, we studied the ability of compounds which alter neurotransmission to potentiate the effect of a sub-convulsive dose of technical grade (40% cis 60% trans) permethrin. Pretreatment, ip, with drugs which blocked noradrenergic receptors or synthesis, such as phentolamine, prazosin, chlorpromazine, α-methyl-p-tyrosine, diethyldithiocarbamic acid and reserpine potentiated the convulsive potency of permethrin. The GABA antagonist picrotoxin and nicotinic blocker mecamylamine also potentiated the effect of permethrin. Muscarinic and serotonergic blockers had no effect. Pretreatment with valium (10 mg/kg), cycloheximide (1 mg/kg) or aminooxy acetic acid (50 mg/kg), ip, significantly protected against the occurrence of neurotoxic symptoms. These data suggest that permethrin produces its neurotoxic effects by an action on specific neurotransmitter systems. [Abstract 1905 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1413. Leander, J. D.; MacPhail, R. C. (Dep. Pharmacol., Univ. North Carolina, Chapel Hill, NC 27514) **Effects of chlordimeform on schedule controlled responding in the pigeon.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 624; 1980.

Chlordimeform HCl, a formamidine insecticide and acaricide with diverse *in vitro* pharmacological effects, was studied on responding maintained by a multiple fixed-ratio 30-response, fixed-interval 5-min schedule of food presentation in pigeons. Intramuscular and po routes of administration were compared over a dose range of 0.625 mg/kg to 40 mg/kg. Behavior-supressing doses (10-40 mg/kg) had rapid onsets (within 10 min) and usually short durations of effect (< 120 min) by both routes of administration. Intermediate doses (1.25, 2.5, and 5 mg/kg) increased the already high rates of responding under the fixed-ratio component in 3 of the 4 birds studied, while generally decreasing the lower average rates of responding under the fixed-interval (FI) component. The effects of chlordimeform on the local rates of responding within the FI component were to increase the low rates at the beginning of the FI while simultaneously decreasing the high rates of responding at the end of the FI. This differential effect on the local rates produced a dose related decrease in the FI quarter-life (a measure of the positive accelerated pattern of responding under the FI). The data also suggests that tolerance occurs upon chronic administration of high doses. [Abstract 1906 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1414. Leighty, E. G. (Columbus Lab., Batelle, Columbus, OH 43201) ***In vivo* and *in vitro* conjugation of a fatty acids to DDT.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 625; 1980.

DDT was found to conjugate with palmitic, stearic, oleic and linoleic fatty acids *in vivo* and be retained in the livers and spleens of male and female rats given chronic ip injections of DDT. Other rat organs or tissues were not analyzed for conjugates. These fatty acid conjugates could also be produced *in vitro* in a rat liver coenzyme A fortified microsomal system using DDOH, a hydroxylated metabolite of DDT, as the substrate. Fatty acid conjugation to toxic foreign compounds such as DDT may be a mechanism by which they are retained in the body and ultimately exert their mutagenic, carcinogenic or other toxic effect. [Abstract 1910 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1415. Hennes, S. C.; Street, J. C.; Doupnik, J. R. (Toxicol. Program, Utah State Univ., Logan, UT 84322) **A computer simulation model of blood cholinesterase inhibition in parathion treated rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 625; 1980.

A computer simulation model of blood cholinesterase inhibition resulting from a single parathion exposure has been developed. The model consists of a set of non-linear differential equations describing the absorption, distribution and metabolism of parathion and the kinetics of inhibition and reactivation of erythrocyte and plasma cholinesterase. The equations are numerically integrated to produce the time-course or the amounts of activities of each of the state variables (plasma parathion and paraoxon concentrations, and cholinesterase activities). The model was tested for validity by comparison of the time-course of plasma and erythrocyte cholinesterase produced by the model to values determined experimentally in male rats at several dosage levels. This model has potential for interpreting human exposures to parathion and other cholinesterase inhibitors, and for investigating *in vivo* toxicological mechanisms. [Abstract 1911 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1416. Covell, D. G.; Abbrecht, P. H. (Univ. Michigan, Ann Arbor, MI 48109) **Changes in warfarin pharmacology during chronic administration.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 746; 1980.

Patients receiving an apparently appropriate maintenance dosage of oral anticoagulant may show unexpected changes in clotting status without readily identifiable cause. The object of this study was to determine if there is a consistent change in warfarin pharmacology that could account for the clinical observations during chronic dosing. Eleven healthy, adult dogs received constant daily oral doses of warfarin for 4 wk. Plasma warfarin concentrations (W), measured by gas chromatography, and prothrombin times (PT) were determined daily. W and PT

decreased significantly ($p < 0.005$) during the last 2 wk of chronic treatment. The decrease in W was not due to increased metabolism of warfarin, since post chronic plasma warfarin clearance (CL) was less than pre-chronic CL. Following a one mo period without warfarin treatment the experiments were repeated with reproducible results. We conclude that during the early phase of chronic warfarin dosing there is a systematic tendency for W to drop with resulting decreases in PT. Since the decrease in W cannot be explained on the basis of increased CL, we hypothesize that it may result from increased tissue binding of warfarin due to induction of additional binding sites. [Abstract 2527 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1417. James, R. C.; Jernigan, B. R.; Harbison, R. D. (Dep. Pharmacol., Vanderbilt Univ., Nashville, TN 37232) **Depletion of mouse hepatic glutathione by the MI complex forming compounds LAAM, NorLAAM, SKF525A and piperonyl butoxide.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 748; 1980.

Isolated hepatocyte studies from phenobarbital induced rats indicate an interaction between glutathione (GSH) and certain amphetamine compounds that are known to form metabolic intermediate (MI) complexes with cytochrome P-450. Since there are a wide variety of compounds capable of forming MI complexes in microsomes, this study examined the possibility that GSH depletion might be a generalized phenomena *in vivo* for compounds that form MI complexes *in vitro*. LAAM (1-α-acetylmethadol), NorLAAM, SKF525A and piperonyl butoxide all caused a dose dependent depletion of hepatic GSH in the mouse. The maximal depletion was 25-35% and occurred about 2 hr after administration. The depletion persists for at least several hr. It is not dependent on prior pretreatment with phenobarbital although induction appears to increase the depletion by LAAM. Preliminary evidence suggests if hepatic GSH is removed by diethylmaleate, SKF525A and NorLAAM are capable of a modest but significant dose dependent elevation in SGPT levels. Thus, the data from this study suggests that GSH depletion *in vivo* may be a generalized effect of compounds forming MI complexes. This property of these compounds raises concern as to whether GSH depletion or inhibition of drug metabolism is more important when given with other drugs forming hepatotoxic metabolites. [Abstract 2537 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1418. Mitchell, A. D.; Paulson, G. D. (Metab. & Radiat. Res. Lab., ARS, SEA, USDA, Fargo, ND 58105) **Metabolism of furavax (2,4,5-trimethyl-*N*-phenyl- 3-furancarboxamide) by isolated rat hepatocytes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt1): 756; 1980.

Furavax is a fungicide intended for use in the control of certain plant diseases. (U-Phenyl-^{14}C) Furavax (4×10^{-5} *M*) was incubated for 4 hr with isolated rat hepatocytes (30 mg/ml) suspended in Waymouth MB752/1 plus 1% BSA. No $^{14}CO_2$ was present in the respiratory gases. HPLC analysis of an ether extract of the cells and media indicated that only 0.5% of the ^{14}C could be recovered as unmetabolized furavax. Most of the remaining ^{14}C (90%) was extracted with methanol and probably represents conjugated furavax metabolites. The methanol extract contained at least 7 different ^{14}C-labeled compounds that were separated by DEAE-Sephadex, Sephadex LH-20, and Porapak Q column chromatography. The polar metabolites in the methanol extract are being characterized by IR and mass spectrometry. An additional 5% of the ^{14}C was extracted with H_2O and 2-4% remained with the insoluble residue. [Abstract 2581 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1419. Misawa, M.; Doull, J.; Uyeki, E. M. (Dep. Pharmacol., Univ. Kansas Med. Cent., Kansas City, KS 66103) **Teratogenic effects of cholinergic insecticides on chick embryos: diazinon treatment on acetylcholinesterase (ChE) and choline acetyltransferase (CAT) activity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 862; 1980.

Teratogenic effects of DZ (diazinon) were assessed morphologically and by radiometric determinations of ChE and CAT activities. Doses of 23-200 μg of DZ per egg were injected on the 3rd day and enzyme activities were measured at 6-20 days of incubation; organs assessed were hind limb, wing and brain. Generally, the studied organs displayed a similar pattern of enzyme alteration. With an injected dose of 200 μg of DZ per egg, ChE activity was markedly inhibited (> 80%) at 7-8 days, about 50% inhibited at 10 days and not inhibited at 13 and 20 days of incubation. On the other hand, CAT activity was not significantly different between DZ- and corn oil- injected embryos. DZ-induced teratology was identified as being nicotinamide reversible (deformations of the hind limb, feather and beak) and pralidoxime reversible (wry neck). These abnormalities were not morphologically evident until the 10th day. Using nicotinamide reversible deformations as criteria, the teratogenic dose of DZ was about 40 μg per egg; using wry neck as a criterion (pralidoxime reversible) the teratogenic dose was about 70 μg per egg. The combination of nicotinamide and pralidoxime reversed the teratogenic effects of DZ (200 μg per egg). [Abstract 3138 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1420. Gorsky, L. D.; Misra, H. P. (Lab. Energy Relat. Res., Univ. California, Davis, CA 95616) **Inhibition of NADPH-dependent lipid peroxidation in bovine lung microsomes by paraquat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 864; 1980.

Incubation of buffered aerobic mixture of bovine lung microsome and NADPH, in the absence of exogenously added iron, resulted in progressive formation of lipid peroxide whose accumulation could be followed at 532 nm as malondialdehyde (MDA). Paraquat (PQ) strongly inhibited this lipid peroxidation. Thus, 50% of MDA formation was inhibited by 4×10^{-5} *M* PQ in the reaction mixture. The MDA color development by lipid peroxides was not affected by this concentration of PQ. Lipid peroxidation was also strongly inhibited by singlet oxygen ($^1O_2$) scavengers, *e.g.*, dimethyl furan and diphenyl furan. Superoxide dismutase (SOD), catalase and mannitol had no significant effect, suggesting that O_2^-, H_2O_2 and OH° are not involved in this process. However, small molecular weight O_2^- scavengers *e.g.*, (Cu-Tyrosine$_2$), cytochrome^{3+}*C* and Mn^{2+} profoundly inhibited this reaction indicating that O_2^- may be involved in conspiring to generate $^1O_2$, which in turn causes lipid peroxidation in lung microsomes and that SOD, being a large molecule, is unable to enter the site of O_2^- production in microsomes to intercept this reaction. These results suggest the involvement of $^1O_2$ in NADPH dependent lipid peroxidation in lung microsomes and that PQ prevents this reaction by inhibiting generation of $^1O_2$ or by inhibiting the interaction of $^1O_2$ with microsomal lipids or both. [Abstract 3146 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1421. Goldstein, J. A.; Linko, P. (NIEHS, NIH, Research Triangle Park, NC 27709) **Alteration of hepatic cytochrome P-450s by chlorinated benzenes (CBs).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 864; 1980.

Rats were given high doses of CBs (250 mg/kg) po or in the diet [1000 ppm hexachlorobenzene (HCB)] for 1 wk. HCB increased benzpyrene hydroxylase (AHH) activity 16-fold, aminopyrine N-demethylase (ND) 3-fold, ethoxyresofurin O-de-ethylase (ERR) 42-fold, and cytochrome P-450 4-fold. The increase in ND resembles that produced by phenobarbital. The increases in AHH and ERR are much greater than those seen with phenobarbital (2.4-fold and 25%), but somewhat less than that produced by 3,4-benzpyrene (BP) (25- and 150-fold). The absorption maximum of the CO-difference spectrum of HCB induced microsomes (449 nm) is intermediate between that of phenobarbital (450 nm) and BP induced microsomes (448 nm). -Napthoflavone selectively inhibited ERR activity in BP and HCB induced microsomes (94 and 88%) compared to control and phenobarbital induced microsomes (61 and 53%). In contrast to HCB, other CBs produced increases in cytochrome P-450, ND, AHH, and ERR similar to those produced by phenobarbital. The order of potency was 1,2,4-triCB ≥ pentaCB > 1,2,3,5-tetraCB > 1,2,3,4-tetraCB > 1,3,5-triCB >> 1,4-diCB. Although the enzymatic properties of the cytochrome P-450 induced by HCB appeared similar to a mixture of phenobarbital and BP induced cytochromes, SDS polyacrylamide gel electrophoresis of the HCB induced microsomes indicated no increases in the two protein bands primarily increased by BP (with molecular wts of 55,000 and 57,000), but rather large increases at 50,000, 53,000 and 54,000. [Abstract 3149 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1422. Bitman, J.; Rumsey, T. S. (Anim. Sci. Inst., USDA, Beltsville, MD 20705) **Plasma thyroxine and triiodothyronine in steers fed ronnel, an organophosphate insecticide.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 891; 1980.

Ronnel, *O,O*-dimethyl-*O*-(2,4, 5-trichlorophenyl) phosphorothioate, an oral larvicide for cattle, also increases growth rate. Feeding trials were conducted to determine if plasma thyroid hormone concentrations were influenced by feeding ronnel to steers. In trial 1, 32 Hereford steers were assigned to one of four treatments: basal diet limit fed at 1.8% of body wt without (LF) or with (LFR) 4 mg ronnel/kg body wt daily; or basal fed *ad libitum* without (AL) or with (ALR) ronnel. After 7 wk on trial, the limited fed steers were switched to *ad libitum* and *ad libitum* to limited, and the trial was continued for 7 additional weeks. Daily gains were consistently increased by ronnel in both the limited (0.7 *vs* 0.69 kg/day) and the *ad libitum* steers (1.33 *vs* 1.10 kg/day). Plasma triiodothyronine (T_3) was not affected by ronnel but thyroxine was 32% greater in LRF and 38% greater in ALR steers. Circulating cholesterol was significantly increased, 8% in LFT and 14% in ALR steers. In trial 2, 24 Hereford steers were assigned to one of four treatments for 16 wk: basal diet *ad libitum* (AL) or AL with ronnel at 1.03, 2.13 or 4.77 mg/kg body wt daily. Daily genes were increased only in the steers fed at the highest ronnel level (1.21 *vs* 1.04 kg/day). T_4 increased 30%, and plasma cholesterol increased 54%. These results suggest that the positive effect of ronnel on steer growth is related to increased thyroid function. [Abstract 3288 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1423. Almeida, A. F.; Pritchard, J. B. (Whitney Lab., Univ. Florida, NIEHS, St. Augustine, FL 32084) **A comparative study of the action of DDT on Na,K-ATPase.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 979; 1980.

The organochlorine pesticide 1,1,1-trichloro-2,2-bis(*p*- chlorophenyl)ethane (DDT) inhibits the membrane bound enzyme, Na,K-ATPase, but its mechanism of action is not clear. We have compared DDT inhibition of Na,K-ATPase from a mammal (bovine brain) with that from a crustacean (blue crab gill) in which this enzyme plays an important role in osmoregulation. In both species, maximal *in vitro* inhibition (~50%) was reached at about 4 μM DDT. I_{25} values were about 0.8 μM for both species. Elevating the DDT concentration of the assay above 4 μM showed an increase in available toxin;

however, the extent of inhibition did not change. These observations are in marked contrast with Na,K-ATPase inhibition by the cardiac glycoside, ouabain. First, this drug produced 100% inhibition of the enzyme and second unlike DDT, its inhibition varied greatly between species (I_{50} = 2.8 μM for beef and 28 μM for blue crab). Thus, although DDT is a potent inhibitor of Na,K-ATPase, only partial inhibition is achieved suggesting the presence of a DDT insensitive Na,K-ATPase. Furthermore, the similarity in the pattern of enzyme inhibition in both species suggests the presence of a common mechanism, perhaps mediated by membrane lipids. [Abstract 3739 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1424. Drummond, L.; Chetty, K. N.; Bailey, M.; Desaiah, D. (Div. Sci. & Technol., MI Coll., Holly Springs, MS 38635) ***In vivo* effect of chlordane on rat brain ATPase system.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 998; 1980.

Experiments were conducted to investigate the *in vivo* effects of chlordane (C) on brain ATPase activities in rats fed with iron sufficient (IS) and deficient (ID) diets. Male Sprague-Dawley rats were fed with 0, 25, 50 and 100 ppm C mixed with IS and ID diets for 12 wk. Body wt gain in rats fed on C in any diet was not significantly different from controls. Three rats from each group were killed at 4, 8 and 12 wk after treatment and the brain P_2 fractions were prepared. Na^+,K^+, oligomycin sensitive (OS) and insensitive (OI) Mg^{2+} ATPases were determined. Na^+,K^+ and OS Mg^{2+} ATPase activities were reduced significantly in C treated rats at all time periods. OI Mg^{2+} ATPase was unaffected by C treatment. Na^+,K^+ and OS Mg^{2+} ATPase activities were decreased in a dose dependent manner reaching a maximum of 60 and 75% in 100 ppm group fed on ID diets as compared to controls receiving the same diet. The rats fed on IS diets also showed decreased enzyme activities but the decrease was 15-20% less than ID groups at any dose of C. An apparent time-response of the decrease in enzyme activities was evident in both ID and IS groups of rats. These results along with previously reported *in vitro* data suggest that C may be exerting its toxic action by inhibiting the ATPase system [Abstract 3844 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1425. Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Cent., Jackson, MS 39216) **Onset and recovery from chlordecone and mirex induced hepatobiliary dysfunction.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 998; 1980.

Male Sprague-Dawley rats were maintained on diets containing uniformly mixed chlordecone (CD, 100 ppm) or mirex (M, 100 ppm). Control group received similarly prepared diet without CD or M. Daily food consumption and body weights were monitored. Every 5th day groups of 3-5 animals were surgically prepared to measure biliary excretion of phenolphthalein glucuronide (PG). Additional parameters determined were: volume of bile secreted; plasma glutamic oxalacetic and pyruvic transaminase activities (SGOT, SGPT); liver weight and CD and M residue in the liver and bile samples. Biliary excretion of PG was suppressed within 10 days by both CD and M and maximal hepatic dysfunction occurred by 35 days of treatment. SGOT and SGPT activities were elevated moderately at the time of maximal hepatic dysfunction. Livers were enlarged and bile secretion increased, M being more potent in this regard. CD residues were higher in liver and bile samples hepatic dysfunction was observed to monitor the above parameters during the recovery phase. It appears that onset of hepatic dysfunction is more rapid with M and recovery slower in comparison to CD induced hepatic dysfunction. Since higher levels of CD were found in the liver than M, the differences between CD and M induced impairment of hepatobiliary function may be more closely related to their intrinsic physico-chemical properties than dispositional differences. [Abstract 3845 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1426. Davis, M. E.; Berndt, W. O.; Mehendale, H. M. (Dep. Pharmacol. Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Effects of hexachloro-(1,3)-butadiene (HCBD) on renal hemodynamics.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 998; 1980.

HCBD is a by-product of a perchloroethylene synthesis and is found in the Mississippi River. Acute administration of HCBD is accompanied by rapidly developing nephrotoxicity, characterized by decreased glomerular filtration rate and urine osmolality. The role of altered renal hemodynamics in the pathogenesis of nephrotoxicity was studied. HCBD was administered (ip, 300 mg/kg) to rats and nutrient blood flow (NBF) was determined as ^{86}Rb distribution and glomerular blood flow estimated by the relative distribution of ^{57}Co-microspheres. HCBD had no effect on NBF at 4 or 24 hr. The distribution of ^{57}Co-microspheres within the cortex was shifted away from the outermost to the inner cortex 4 hr after HCBD (70% of control). By 7 hr the cortex appeared pale and the medulla engorged with blood. Thus, HCBD altered intra-renal blood flow and this may be important in the initial stages of HDBD induced nephrotoxicity. [Abstract 3846 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1427. Danner, J. (DRDS, NIOSH, Dep. HEW, Morgantown, WV 26506) **The use of 1-anilino-8-naphthalene sulphonate to monitor the interactions of chlorophenols with phospholipid membranes (liposomes).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 999; 1980.

The fluorescence intensity (F_{480}), at pH 8, of 1-

anilino-8-naphthalene sulfonate (ANS) bound to phospholipid membranes (liposomes) was decreased in the presence of mono-, di- and pentachlorophenols. No shifts in excitation or emission spectra occurred and no decreases in ANS fluorescence intensity were observed in the presence of the chlorophenols if membranes were absent. Double reciprocal plots exhibited a common intersection on the ordinate in the presence of 2,4-dichloro- and pentachlorophenol (PCP). The phenols were probably competing with ANS for sites on the membranes but were not altering the environment of the remaining fluorophore molecules. An exception was 2,6-dichlorophenol which, at pH 8, had no effect on the membrane bound ANS F_{480}. The inactivity of the 2,6-dichloro analog was not due to a high proportion of the neutral species because at pH 4 where all chlorophenols are neutral, a decreased ANS F_{480} was observed. Using liposomes prepared from dimyristoyl lecithin a 50% decrease in membrane bound ANS F_{480} required 0.05 m*M* PCP and 0.2-0.5 m*M* dichlorophenols (excluding the 2,6-derivative). These results are consistent with published toxicological data on polychlorinated phenols which show an order of toxicity of PCP > 2,4-dichlorophenol > 2,6-dichlorophenol. [Abstract 3850 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1428. Birnbaum, L. S.; Decad, G. M.; Matthews, H. B. (NIEHS, Research Triangle Park, NC 27709) **Disposition of tetrachlorodibenzofuran in male rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 999; 1980.

2,3,7,8-Tetrachlorodibenzofuran (TCDF) is an extremely toxic environmental pollutant found as a contaminant in commercial polychlorinated biphenyls and pentachlorophenol (PCP) mixtures. The distribution of ^{14}CCDF (purity > 99%) was studied in 200-250 mg male Fischer 344 rats after oral and iv administration. TCDF was completely absorbed at 2 dose levels (0.1 and 1.0 μmol/kg). The liver was the main site of TCDF accumulation, with lesser amounts being present in the adipose tissues and skin. However, within 3 days, less than 5% of the initial dose remained in the liver or fat and less than 2% remained in the skin, with no other tissues exhibiting significant amounts of radioactivity. More than 50% of the administered dose was excreted in the feces within 48 hr and over 90% within 5 days. Approximately 3% of the dose was eliminated in the urine within 5 days. In studies of biliary excretion, 5% of the radioactivity initially administered as TCDF was excreted in the bile within 4 hr as one or more metabolites of TCDF. None of the material removed co-chromatographed with the parent compound. Thus, TCDF is completely absorbed, concentrated in the liver, fat and skin, metabolized, and excreted primarily by the fecal route. [Abstract 3851 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1429. Misra, H. P.; Gorsky, L. D. (Lab. Energy Related Health Res., Univ. California, Davis, CA 95616) **Inhibition by paraquat of NADPH-dependent chemiluminescence in lung microsomes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1012; 1980.

Chemiluminescence which is associated with microsomal NADPH oxidase system has been studied in bovine lung microsomes. Chemiluminescence was measured as the counts/min obtained in a tritium channel of a liquid scintillation counter operated in the out-of-coincidence mode. Thus when 4.9 mg/ml of microsomal protein was exposed to 200 μmole of NADPH in 5.5 ml of Ca^{2+} free phosphate buffered saline, pH 7.2, chemiluminescence increased gradually to a peak response at about 30 min and then slowly decayed to ground level over the next 2-3 hr. Singlet oxygen scavengers, *e.g.* dimethyl furan and diphenyl furan, strongly inhibited this response. A similar inhibitory effect was also noted with cytochrome *c* and catalase. However, superoxide dismutase (5 μg/ml) and mannitol (6 m*M*) had no significant effect. Paraquat at concentrations of 0.045 m*M* and 0.45 m*M* exerted profound inhibitory effect. Paraquat also inhibited the oxygen uptake in the system. The maximum inhibition of O_2 uptake actually achieved was only 36% by either 2 or 5×10^{-4} *M* paraquat. These data demonstrate the involvement of singlet molecular oxygen in microsomal NADPH oxidase system associated chemiluminescence and paraquat suppresses this response by either inhibiting the rate of generation of this activated oxygen species or by quenching them efficiently in the medium. [Abstract 3920 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1430. Tofilon, P. J.; Clement, R. P.; Piper, W. N. (Dep. Pharmacol., UCSF, San Francisco, CA 94143) **The effects of dibromochloropropane on rat testicular heme synthesis.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1013; 1980.

Recent epidemiological studies have revealed oligospermia and azoospermia in workers exposed to DBCP (dibromochloropropane; a highly effective nematocide). In an attempt to elucidate the mechanism by which this pesticide impairs spermatogenesis, we have examined the effects of DBCP on rat testicular heme synthesis. DBCP (20 mg/kg) was administered orally in a single dose to mature, male rats. Forty-eight hr after DBCP administration, testicular microsomal heme levels were 73% of controls and δ-aminolevulinic acid (ALA) synthetase activity was 166% of controls. Both parameters returned to control values by 6 days after treatment. No change in heme oxygenase activity was detected. Twenty-four hr after DBCP administration, there was no significant changes in microsomal heme or ALA synthetase activity; however, ^{14}C-ALA incorporation into testicular microsomal heme was found to be 43% of control. The activities of testicular sorbital dehydrogenase and NADPH cytochrome *c* reductase were measured to test the possibility of a non-specific inhibition of protein synthesis by DBCP. No statistically significant decrease in either en-

zyme activity was detected after DBCP treatment. These data suggest that DBCP inhibits testicular heme synthesis. [Abstract 3926 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1431. Frank, L.; Summerville, J. (Vet. Adm. Hosp., Miami, FL 33101) **Prolonged survival after paraquat: role of antioxidant lung enzymes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1017; 1980 (1 reference).

Treatment of O_2-exposed adult rats with low doses of bacterial endotoxin (E) results in increased lung antioxidant enzyme activity and a marked protective effect against pulmonary O_2 toxicity. Since paraquat (P) toxicity is believed mediated by O_2 free radicals, animals with increased lung antioxidant enzyme levels should have increased resistance to the toxic lung effects of P. E-treated (500 μg/kg) rats were exposed to > 95% O_2 for 48 hr. Lung superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GP) activity after O_2 exposure were: (mean ± SE for enzyme activity/lung) 366 ± 16, 5025 ± 748, and 37.6 ± 6.2, respectively, for air controls (8) and 540 ± 42*, 6947 ± 575*, and 47.6 ± 4.8, respectively, for O_2 + E (8 animals). $P < 0.05$ for those marked with * when compared to air controls. Animals then received P (40 mg/kg in saline, ip). Survival results 5 days after administering P were 32% for air controls + P and 61% for O_2 + E + P animals. $P < 0.05$ for O_2 + E + P. These results support the idea that P-induced lung damage is mediated by O_2 free radical generation and that the antioxidant defense systems serve an important protective function against lung toxicity due to oxidant agents. [Abstract 3947 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1432. White, R. D.; Sipes, I. G.; Gandolfi, A. J. (Arizona Health Sci. Cent., Univ. Arizona, Tucson, AZ 85724) **Determination of ethylene bromide induced DNA injury by alkaline elution.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1022; 1980.

Alkaline elution of DNA from cell lysates has been a useful method for detecting DNA damage induced by chemicals or radiation. In order to overcome the restriction of sample size ($< 2 \times 10^6$ cells) and the need for radiolabeled DNA, we have increased the filter area almost four fold (d = 47 mm) and utilized a microfluorimetric assay for DNA. X-irradiated L1210 cells (3-4 × 10^6 cells/filter) exhibited a dose dependent elution pattern with this system. To enrich the DNA in the sample applied to this system from mammalian sources, hepatic nuclei were isolated from chemically treated mice. These nuclei may be stored at −70°C in 5 m*M* Tris HCl, pH 7.4, 15 m*M* EtSh, 1 m*M* PMSF, 25% glycerol up to 3 days without altering the DNA alkaline elution pattern. Using this system, N-nitrosodimethylamine (5-10 mg/kg, ip) caused a dose dependent increase in the elution rate of hepatic DNA from male Swiss mice sacrificed 1 hr after exposure. Ethylene bromide (ethylene dibromide; 150-200 mg/kg, po) increased the elution of hepatic DNA obtained from phenobarbital pretreated male Swiss or B6C3fl mice sacrificed 2 hr after exposure. The use of isolated nuclei and larger filters makes the alkaline elution analysis a sensitive technique for assessing chromosomal injury by chemicals. [Abstract 3971 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1433. O'Reilly, R. A.; Trager, W. F.; Motley, C. H.; Howald, W. (Dep. Med., Santa Clara Valley Med. Cent., San Jose, CA 95128) **Interaction of secobarbital with $^{12}C/^{13}C$ warfarin pseudoracemates in man.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1028; 1980.

To evaluate the interaction of secobarbital (SB) with racemic warfarin (*RS*-W), S(-)-warfarin (*S*-W) was synthesized with ^{13}C label in the 2 position and added to ^{12}C R(+)-warfarin (*R*-W) to form a $^{12}C/^{13}C$-W pseudoracemate. In 6 normal humans a single oral dose of *RS*-W, 1.5 mg/kg, was administered with and without daily SB, 100 mg orally, beginning 7 days before W and continuing throughout the hypoprothrombinemia. Daily plasma samples were analyzed for W content and 1-stage prothrombin time. Unchanged W was fractionated by forward phase HPLC, and the enantiomorphic ratios were determined by chemical ionization-mass spectrometry. A highly significant reduction of prothrombin time occurred during concurrent SB compared with W alone ($p < 0.001$). There was a significant increase in clearance of *R*-W ($p < 0.05$) and *S*-W ($p < 0.03$) during prothrombin time of *RS*-W by increasing the clearance both pf *S*-W and *R*-W. Unlike phenylbutazone, the interaction of SB with *RS*-W is not stereoselective. [Abstract 4007 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1434. MacPhail, R. C.; Leander, J. D. (Neurotoxicol. Div., US EPA, Research Triangle Park, NC 27711) **Effects of chlordimeform on the schedule-controlled performance of rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(3Pt2): 1102; 1980.

Chlordimeform (CDME) is a formamidine insecticide/acaricide with diverse pharmacological actions. Little is known, however, about the behavioral effects of CDME. Eight adult male rats were therefore trained to perform during 45 min sessions under a schedule that arranged milk reinforcement after every 10 (FR 10) or 40 (FR 40) responses. Once performances had stabilized, CDME was periodically administered ip (1 ml/kg b. wt) in dosages of 1.25 to 40 mg of the HCl salt/kg b. wt, 10 min prior to testing. Control performance for all rats was characterized by a pause after each milk reinforcement followed by a rapid rate of responding until the next reinforcement. Following CDME, response rate decreased and pause duration increased in a dose-related fashion. The effects of

CDME (5, 10 mg/kg) given 50 min prior to testing did not differ from those when given 10 min prior to testing. No consistent differences were apparent in the effects of CDME on performance between rats trained under FR 10 and those trained under FR 40. [Abstract 4400 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

80-1435. Partridge, G. G. (Dep. Genet., Univ. Liverpool, Liverpool L69 3BX, England) **Relative fitness of genotypes in a population of *Rattus norvegicus* polymorphic for warfarin resistance.** *Heredity* 43(2): 239-246; 1979 (16 references).

The level of resistance to warfarin in a natural population of rats was monitored after extensive poisoning of the population. The proportion of resistant to non-resistant live capture sample animals dropped from 80% to 33% over an 18 mo period after withdrawal of the poison. It is suggested that resistance to warfarin and increased vitamin K requirements are pleiotropic effects of the same allele (Rw^2), and that Rw^2Rw^2 and Rw^1Rw^2 genotypes are less fit than Rw^1Rw^1 under natural conditions. The relative fitness of these genotypes were calculated to be Rw^2Rw^2 0.46, Rw^1Rw^2 0.77 and Rw^1Rw^1 1.00. The Rw^2 alle was concluded not to be a recessive lethal due to the presence of homozygous individuals in some samples.

80-1436. Anonymous **Chlordane.** *IARC Monogr.* 20: 45-65; 1979 (84 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information relating to the production, use, occurrence and analysis of chlordane are listed. Biological data relevant to the evaluation of carcinogenic risk to humans from this chemical are presented. Carcinogenicity studies conducted on the mouse are discussed. Data on the toxic effects of chlordane, embryotoxicity and teratogenicity findings, the absorption, distribution, excretion and metabolism of the chemical and the results of mutagenicity testing are given. Case reports and epidemiological studies are also included. It is concluded that chlordane is carcinogenic in mice, but that although there are a number of cases of cancer in humans the data do not support the conclusion that chlordane is carcinogenic to humans.

80-1437. Anonymous **Chlordecone.** *IARC Monogr.* 20: 67-81; 1979 (58 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, and technical products and impurities of chlordecone are listed. Information is also provided on the production, uses, occurrence and analysis of chlordecone. Carcinogenicity studies on the results of oral administration of the chemical to mice and rats are reviewed. Data are included on the toxic effects of the chemical, its embryotoxicity and teratogenicity and the absorption, distribution, excretion and metabolism of chlordecone in mice, rats, dairy cows and hens. Effects of the chemical on industrial workers are noted. It is concluded that chlordecone is carcinogenic in mice and rats, and that chlordecone should be considered to present a carcinogenic risk to humans.

80-1438. Anonymous **1,2-Dibromo-3-chloropropane.** *IARC Monogr.* 20: 83-96; 1979 (42 references).

Data on synonyms and trade names, structural and molecular formula and molecular weight, chemical and physical properties, and technical products and impurities of 1,2-dibromo-3-chloropropane are listed. Information concerned with the production, use, occurrence and analysis of the compound is also given. Results of tests wherein the chemical was orally administered to mice and rats are presented. Toxic effects of the compound and information concerning mutagenicity in humans are considered. It is concluded that the chemical is carcinogenic in mice and rats, but that there is no adequate data at present to evaluate fully its possible hazards to humans. It is suggested that 1,2-dibromo-3-chloropropane be regarded as though it presented a carcinogenic risk to humans.

80-1439. Anonymous **Dichlorvos.** *IARC Monogr.* 20: 97-127; 1979 (144 references).

Data on synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties of the pure substance, and technical products and impurities of dichlorvos are listed. Data concerning the production, use, occurrence and analysis of dichlorvos is given. Results of carcinogenic studies involving the oral administration of dichlorvos to mice and rats, and studies involving inhalation and/or intratracheal administration of the chemical to rats, are presented. Toxic effects of the chemical are discussed as they concern mice, cats, chickens, rats, dogs, rabbits, and rhesus monkeys. Results of embryotoxicity and teratogenicity studies are given. Absorption, distribution, excretion and metabolism of dichlorvos are discussed in pigs, rats, and mice. The reaction of dichlorvos with macromolecules is considered. Toxic effects and metabolism studies of dichlorvos in humans are reviewed. It is concluded that available data is not adequate to allow an evaluation of the carcinogenicity of dichlorvos.

80-1440. Anonymous **Heptachlor and heptachlor epoxide.** *IARC Monogr.* 20: 129-154; 1979 (89 references).

Synonyms and trade names, structural and

molecular formulae and molecular weights, chemical and physical properties of each pure substance, technical products and impurities, and information on the production, use, occurrence and analysis of heptachlor and heptachlor epoxide are given. Carcinogenicity studies based on the oral administration of the chemicals to mice or rats are presented. Toxic effects, possible embryotoxicity and teratogenicity, absorption, distribution, excretion, and metabolism of the chemicals in various animal models are discussed. Mutagenicity studies are reviewed. Case reports suggest a relationship between exposure to heptachlor or chlordane and blood dyscrasias in humans. Associations with acute leukemia are also suggested. It is concluded that hepatachlor containing chlordane is carcinogenic to mice, and that limited evidence exists for the carcinogenicity of heptachlor epoxide in experimental animals.

80-1441. Anonymous **Hexachlorobenzene.** *IARC Monogr.* 20: 155-178; 1979 (120 references).

Information on synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and the production, use, occurrence and analysis of hexachlorobenzene is given. Results of carcinogenicity studies involving oral or intraperitoneal administration of the compound to mice and hamsters are presented. Studies and data on toxic effects, embryotoxicity and teratogenicity, absorption, distribution, excretion, metabolism and mutagenicity are discussed. The occurrence of widespread porphyria cutanea tarda after human consumption of grain treated with hexachlorobenzene in Turkey between 1955 and 1959 is noted. It is concluded that hexachlorobenzene is carcinogenic in mice and hamsters. It is suggested that, although adequate data are not available, the chemical be considered to present a carcinogenic risk to humans.

80-1442. Anonymous **Hexachlorobutadiene.** *IARC Monogr.* 20: 179-193; 1979 (38 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, technical products and impurities, and information on production, use, occurrence and analysis of hexachlorobutadiene are listed. Results of carcinogenicity studies involving the oral administration of hexachlorobutadiene to rats and the intraperitoneal administration of the chemical to mice are presented. Toxic effects, embryotoxicity and teratogenicity, absorption, distribution, excretion and metabolism, and mutagenicity findings are considered. Toxic effects on humans exposed seasonally to hexachlorobutadiene and polychlorobutane-80 in vineyards included hypotension, cardiac disease, chronic bronchitis, disturbances of nervous function and chronic hepatitis. It is concluded that there is limited evidence that hexachlorobutadiene is carcinogenic in rats.

80-1443. Anonymous **Hexachlorocyclohexane (technical HCH and lindane).** *IARC Monogr.* 20: 195-239; 1979 (195 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of the various isomers of hexachlorocyclohexane (HCH; BHC) are listed. Carcinogenic studies concerned with the oral administration of HCH in mice and rats are reviewed. Results of skin applications, subcutaneous and/or intramuscular administration, intraperitoneal administration and carcinogenic studies of metabolites are all considered. Toxic effects, embryotoxicity and teratogenicity, and the absorption, distribution, excretion and metabolism of the chemical are also discussed. It is concluded that α-HCH, lindane and technical HCH are carcinogenic in mice. There is also limited evidence that β-HCH is carcinogenic in mice.

80-1444. Anonymous **Hexachlorophene.** *IARC Monogr.* 20: 241-257; 1979 (75 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information concerning the production, use, occurrence and analysis of hexachlorophene are listed. Carcinogenicity studies involving oral administration of the chemical to rats and results of skin applications of the chemical to mice are discussed. Toxic effects, data on embryotoxicity and teratogenicity, absorption, distribution, excretion and metabolism of the compound are also considered. Hexachlorophene applied liberally to patients with burns or to infants leads to circulatory failure, body temperature fluctuations and central nervous symptoms such as headache, twitching, convulsions and death. It is concluded that available data is not adequate to allow an evaluation of the carcinogenicity of hexachlorophene.

80-1445. Anonymous **Methoxychlor.** *IARC Monogr.* 20: 259-281; 1979 (100 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, technical products and impurities, and information on production, use, occurrence and analysis of methoxychlor are listed. Results of carcinogenicity studies involving the oral administration, skin application, and subcutaneous and/or intramuscular administration of methoxychlor to rats and mice are reviewed. Toxic effects are listed, and information is given concerning embryotoxicity and teratogenicity, absorption, distribution, excretion and metabolism. It is concluded that evidence available at present does not indicate that methoxychlor is carcinogenic in experimental animals.

80-1446. Anonymous **Mirex.** *IARC Monogr.* 20: 283-301; 1979 (75 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities of mirex are listed. Information is also given on production, use, occurrence and analysis of mirex. Results of carcinogenicity studies involving the oral administration of mirex to mice, and rats are reviewed. Findings are also presented concerning the subcutaneous and/or intramuscular administration of mirex to mice. Toxic effects of the compound on chickens, mice and rats are described. Embryotoxicity and teratogenicity findings and information on the absorption, distribution, excretion and metabolism of mirex in rats and quail are noted. Mutagenicity tests on rats are reviewed. It is concluded that mirex is carcinogenic in mice and rats. It is assumed reasonable to consider mirex a carcinogenic risk for man.

80-1447. Anonymous **Pentachlorophenol.** *IARC Monogr.* 20: 303-325; 1979 (79 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties and information on the production, use, occurrence, and analysis of pentachlorophenol (PCP) are listed. Results are presented of carcinogenicity studies involving the oral administration of the compound to mice and rats and the subcutaneous and/or intramuscular administration to mice. Toxic effects of the chemical on rats are reviewed. Information on embryotoxicity, teratogenicity, absorption, distribution, excretion and metabolism of pentachlorophenol in mice, rats, and hamsters is given. Mutagenicity tests on lateral roots of *Vicia faba* seedlings are described. Toxic effects on humans include chloracne and disorders of the nervous system and liver. It is concluded that available data do not permit an evaluation of the carcinogenicity of pentachlorophenol to be made at this time.

80-1448. Anonymous **Toxaphene (polychlorinated camphenes).** *IARC Monogr.* 20: 327-348; 1979 (89 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on the production, use, occurrence and analysis of toxaphene are given. Results of carcinogenicity studies involving the oral administration of toxaphene to mice and rats are discussed. Findings are also presented concerning the toxic effects of toxaphene to rats, mice, chickens and quail. Information on embryotoxicity, teratogenicity, absorption, distribution, excretion and metabolism of toxaphene in rats, mice and cows is presented. Mutagenicity tests on mice are reviewed. Case reports are reviewed which link toxaphene with acute aplastic anemia. It is concluded that toxaphene is carcinogenic in mice and rats, and it is suggested that, although sufficient data are not available, toxaphene should be considered to pose a carcinogenic risk to humans.

80-1449. Anonymous **2,4,5- And 2,4,6-trichlorophenols.** *IARC Monogr.* 20: 349-367; 1979 (51 references).

Synonyms and trade names, structural and molecular formulae and molecular weights, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of 2,4,5- and 2,4,6-trichlorophenols are given. Results of carcinogenicity studies involving the oral administration and the subcutaneous and/or intramuscular administration of the compounds to mice are reviewed. Toxic effects of the chemicals on rats are described. Information is listed on absorption, distribution, excretion and metabolism of the trichlorophenols in cattle and sheep. Mutagenicity test results on flower buds of *Vicia faba* are presented. Adverse effects among humans due to occupational exposure to these chemicals include persistent chloracne, liver dysfuction, neuromuscular weakness, porphyria and psychological changes. It is concluded that available data do not permit an evaluation of the carcinogenicity of 2,4,5- and 2,4,6-trichlorophenols to be made at this time.

80-1450. Anonymous **Carbon tetrachloride.** *IARC Monogr.* 20: 371-399; 1979 (135 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on the production, use, occurrence and analysis of carbon tetrachloride are listed. Results of carcinogenicity studies involving the oral administration of the chemical to mice, rats, hamsters, and trout are given. Findings are also reviewed concerning the inhalation and/or intratracheal administration and the subcutaneous and/or intramuscular administration of carbon tetrachloride to rats. Toxic effects of the compound on rats, dogs, rabbits and guinea pigs are described. Embryotoxicity and teratogenicity finding and information on the absorption, distribution, excretion and metabolism of the chemical are presented. The ability of carbon tetrachloride to bind to macromolecules and results of mutagenicity tests are considered. Major pathological changes in humans occur in the liver and kidney. Inhalation of the chemical can cause central nervous system depression, pulmonary edema, alveolitis and fatal cardiac arrhythmias. It is concluded that carbon tetrachloride is carcinogenic in experimental animals. It is suggested to regard carbon tetrachloride as if it presents a carcinogenic risk to humans.

80-1451. Anonymous **Chloroform.** *IARC Monogr.* 20: 401-427; 1979 (121 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of chloroform are given. Results of carcinogenicity studies involving the oral administration of chloroform to mice and rats are presented. Findings are also reviewed concerning the subcutaneous and/or intramuscular administration of chloroform to newborn mice and the intraperitoneal administration of chloroform to mice. Toxic effects on chloroform to rats and mice are described. Embryotoxicity and teratogenicity findings, and information on the absorption, distribution, excretion and metabolism of chloroform in rats and mice are given. Mutagenicity tests are also reviewed. In humans rapid death has followed chloroform exposure due to cardiac arrest and delayed death has resulted from liver and kidney damage. It is concluded that chloroform is carcinogenic in mice and rats and should be regarded as presenting a carcinogenic risk to humans.

80-1452. Anonymous **1,2-Dichloroethane.** *IARC Monogr.* 20: 429-448; 1979 (71 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of 1,2-dichloroethane are given. It is registered in the US for agricultural use in various formulations with other fumigants or post-harvest fumigation of grain and for use in orchards, agricultural premises and mushroom houses. It is exempted from the requirement of a tolerance when used as a fumigant after harvest for barley, corn, oats, popcorn, rice, rye, sorghum and wheat. Results of carcinogenicity studies are presented. Toxic effects of the compounds in rats include central nervous system depression, anaesthesia and coma. Absorption, distribution, excretion and metabolism of the chemical in rats are described. It is concluded that 1,2-dichloroethane is carcinogenic in mice and rats, and it is suggested to present a carcinogenic risk to humans.

80-1453. Anonymous **Dichloromethane.** *IARC Monogr.* 20: 449-465; 1979 (70 references).

Synomyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of dichloromethane are given. The chemical is registered for use in the US as an insecticide for commodity fumigation of a variety of grains. It is exempted from the requirement of a tolerance for residues when used as a fumigant after harvest for barley, corn, oats, popcorn, rice, rye, sorghum and wheat and for the post-harvest fumigation of citrus fruits. Results of carcinogenic tests involving ip administration to mice are presented. Toxic effects of the compound in mice and dogs are discussed. Findings of embryotoxicity and teratogenicity studies, and information on the absorption, distribution, excretion, and metabolism of dichloromethane in rats are included. In humans the chemical acts primarily on the central nervous system causing narcosis. Long term occupational exposure causes damage to the liver as well. It is concluded that available data do not permit an evaluation of the carcinogenicity of dichloromethane at this time.

80-1454. Anonymous **Hexachloroethane.** *IARC Monogr.* 20: 467-476; 1979 (29 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on production, use, occurrence and analysis of hexachloroethane are given. This chemical is used in the US as a constituent of various fungicidal and insecticidal formulations. Results of carcinogenicity studies involving the oral administration of hexachloroethane to mice and rats are reviewed. There is limited evidence at this time that hexachloroethane is carcinogenic in experimental animals.

80-1455. Anonymous **1,1,2,2-Tetrachloroethane.** *IARC Monogr.* 20: 477-489; 1979 (40 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and impurities, and information on the production, use, occurrence and analysis of 1,1,2,2-tetrachloroethane are given. Results of carcinogenicity studies involving the oral administration of 1,1,2,2-tetrachloroethane to mice and rats are presented. Findings are also presented on ip administrations of the compound to mice. Toxic effects of the compounds on dogs, mice and rats are described. Embryotoxicity and teratogenicity findings, and information on the absorption, distribution, excretion and metabolism of the chemical in mice are reviewed. Mutagenicity test results are described. It is concluded that 1,1,2,2-tetrachloroethane is carcinogenic in experimental animals.

80-1456. Anonymous **1,1,1-Trichloroethane.** *IARC Monogr.* 20: 515-531; 1979 (61 references).

Synonyms and trade names, structural and molecular formulae and molecular weight, chemical and physical properties, technical products and of 1,1,1-trichloroethane are given. The chemical is used in the US in insecticide formulations. It is approved by the US FDA for use in packaging, transporting or holding food. This chemical is exempted from the requirement of a tolerance

for residues when it is used as a solvent in pesticide formulations applied to growing crops and raw agricultural commodities after harvest and when it is used in the post-harvest fumigation of citrus fruits. It is also exempt from residue tolerance limits when used as a solvent in pesticide formulations to be used on animals, when it comprises not more than 25% of the formulation. Findings of carcinogenicity, embryotoxicity and teratogenicity studies are reviewed. Available data do not permit an evaluation to be made of the carcinogenicity of 1,1,1-trichloroethane.

80-1457. Singh, S. P.; Yadav, N. K. (Dep. Agron., Haryana Agric. Univ., Hissar, India) **Toxicity of some herbicides to major carp fingerlings.** *Indian J. Ecol.* 5(2): 141-147; 1978 (10 references).

Studies were performed to determine the effects of several herbicides on carp fingerlings. Fifteen fish 4-5 cm in length were exposed to graded concentrations, ranging from 1 to 100 ppm, of ten different herbicides for 96 hr. In another experiment fish were exposed to pesticides in the presence of submerged aquatic weeds. Copper sulfate was the most toxic; even at its lowest concentration, 40% mortality occurred. Glyphosphate and terbutryne were also toxic at 1 ppm concentrations. Other herbicides, arranged in order of decreasing toxicity, were paraquat > diuron > simazine > dalapon > diquat > MSMA > 2,4-D. Fish exposed to herbicides in the presence of weeds were more susceptible than those in weed-free environments.

80-1458. Srivastava, L. K.; Baquer, N. Z.; Habibulla, M.* (Sch. Life Sci., Jawaharlal Nehru Univ., New Dehli 110067, India) **Effect of *p,p'*-DDT on hexokinase & AT-Pase in nervous system of cockroach, frog & rat.** *Indian J. Exp. Biol.* 17(11): 1204-1207; 1979 (29 references).

Male Holtzman rats, frogs (*Rana hexadactyla*) and cockroaches (*Periplaneta americana*) were used to determine the effects of *p,p'*-DDT on hexokinase and ATPase. All animals were given a single overnight exposure to *p,p'*-DDT by spraying 1 ml of 10% *p,p'*-DDT (w/v) suspension in water into a glass aquarium and allowing the chamber to saturate for 0.5 hr. After 12 hr exposure, brains from rats, frogs and cockroaches and subesophageal, thoracic, and abdominal ganglia from cockroaches were removed and homogenates prepared. Hexokinase activity was measured spectrophotometrically, and Na^+,K^+ and Mg^{2+} ATPase were estimated in various parts of the brain tissue. None of the enzymes studied changed significantly in the cockroach nervous system following *p,p'*-DDT treatment. Hexokinase decreased in the cerebellum of the frog and rat. Na^+,K^+ ATPase decreased in the medulla oblongata of the frog brain, and in the rat cerebellum. Mg^{2+} ATPase activity decreased in the frog cerebral hemisphere and medulla oblongata, and in the rat cerebellum and cerebral hemisphere. Compartmentalization of hexokinase and ATPase activity in the brain was observed; hexokinase activity was significantly higher in the region richest in neurons. It is concluded that *p,p'*-DDT does have the potential to affect the brain AT-Pase and hence affect membrane potentials.

80-1459. Free, J. B.; Ferguson, A. W. (Rothamsted Exp. Stn., Harpenden, Hertfordshire AL5 2JQ, England) **Foraging of bees on oil-seed rape (*Brassica napus* L.) in relation to the stage of flowering of the crop and pest control.** *J. Agric. Sci.* 94(1): 151-154; 1980 (20 references).

In order to assess the toxicity to bees by post-flowering applications of insecticides, ten crops of winter sown rape crops were observed at different stages of flowering. Honeybee, bumblebee and flower-stage counts were performed and the approximate weight of rape pollen was calculated from the percentage of oil-seed rape pollen grains in samples of 500 pollen grains. The weight and percentage of pollen collected and the honeybee counts did not decrease even after ⩾ 90% of the rape flowers had shed their petals. Bumblebee counts were increased at the latter stages of flowering. It is concluded that post-flowering applications of pest control agents, such as triazophos, phosalone or endosulfan, will cause the bee populations to be at risk. It is suggested that alternative, bee-safe measures, such as bee alarm pheromones or bee repellents, be used for crop protection even at late flowering stages.

80-1460. Miller, R. A.; Bussell, N. E.; Bongiovanni, R. (Inst. Dent. Res., Walter Reed Army Med. Cent., US Army, Washington, DC 20012) **The effects of organophosphate poisoning and its antidote on amino acid levels in saliva.** *J. Dent. Res.* 59(A): 401; 1980.

Studies were designed to determine the salivary excretory patterns of some amino acids following administration of the organophosphate Sarin (isopropylmethylphosphonofluoridate) , a cholinesterase inhibitor, and its antidote. Five cynomologus monkeys were administered an LD50 dose of Sarin iv, followed 5 min later by administration of an antidote (TMB-4 20 mg/ml, Benactyzine HCl 2.1 mg/ml and atropine sulfate 0.52 mg/ml). Saliva samples were collected before treatment, after Sarin dosing, and after antidote administration. Amino acids were analyzed by reverse phase HPLC and detected by uv and fluorescence spectrometry. Sarin treatment caused an increase in arginine, histidine and phenylalanine, and a decrease in alanine, glycine, glutamic acid and lysine. Stimulation by the cholinergic agent increased salivary glycine levels, but they returned to baseline after administration of the antidote. Stimulation decreased proline and phenylalanine, and the levels remained approximately the same upon atropine administration.

80-1461. Waller, G. D.; Barker, R. J. (Carl Hayden Bee Res. Cent., ARS, SEA, USDA, Tucson, AZ 85719) **Effects**

of dimethoate on honey bee colonies. *J. Econ. Entomol.* 72(4): 549-551; 1979 (10 references).

Onion, *Allium cepa* L., plants were sprayed with dimethoate. Nectar samples collected from these plants over a 2-wk period contained up to 7 ppm dimethoate. There was a gradual reduction in nectar contamination over the sampling period. Colonies of *Apis mellifera* L. that fed on sugar solutions containing 5.0, 1.0, 0.2 or 0 ppm dimethoate were compared for adult survival, comb building, honey storage, and ability to produce offspring. The bees could choose between sugar solutions with or without dimethoate; nevertheless, colonies that received dimethoate were seriously damaged at all concentrations tested. (Author abstract by permission)

80-1462. Chu, I.; Villeneuve, D. C.; Secours, V.; Ruddick, J. A.; Becking, G. C.; Valli, V. E. (Environ. Toxicol. Div., Environ. Health Dir., Health Prot. Branch, Ottawa, Ontario, Canada) **2,8-Dihydromirex: a twenty-eight day sub-acute toxicity study in the rat.** *J. Environ. Sci. Health B* 15(1): 87-107; 1980 (20 references).

Weanling male and female Sprague-Dawley rats were fed diets containing 0-50 ppm dihydromirex (groups 1-5) for 28 days; group 6 received 50 ppm photomirex, while group 7 animals were given 50 ppm dietary mirex. The highest concentrations of dihydromirex caused 60 and 80% mortalities among male and female rats, respectively. Photomirex consumption significantly decreased wt gain in both sexes ($p < 0.05$). Animals dosed with 50-500 ppm dihydromirex, and photomirex and mirex-exposed animals exhibited increased liver weights and histological alterations in livers (panlobular ballooning of hepatocytes, aniskaryosis, and fatty vacuolation) and of thyroid tissues (collapsed follicles and increased epithelial height). Dihydromirex accumulated in livers in a dose dependent manner, and exhibited toxic effects similar to mirex.

80-1463. Trottman, C. H.; Desaiah, D. (Dep. Chem., Jackson State Univ., Jackson MS 39217) **Induction of rat hepatic microsomal enzymes by toxaphene pretreatment.** *J. Environ. Sci. Health B* 15(1): 121-134; 1980 (21 references).

Adult male Sprague-Dawley rats were fed diets containing 0, 50, 100, 150 and 200 ppm toxaphene for 14 days. Liver weights of all dosed animals increased. For those receiving 200 ppm the increase was significant ($p < 0.05$). On day 15 the livers of some animals were removed and post-mitochondrial supernatants were prepared at 9000 *g*. During measurements of microsomal enzymatic activity hydroxylation of pentobarbital and aniline were significantly enhanced ($p < 0.05$) in rats dosed with 100-200 ppm toxaphene. Toxaphene caused a marked reduction in pentobarbital sleeping time, from 173 min in control animals to 66 and 70 min in animals fed 150 and 200 ppm of the pesticide, respectively. Hepatic microsomal P-450, NADPH-cytochrome c-reductase and hydrogenase activities increased ($p < 0.05$) following toxaphene exposure.

80-1464. Sitkiewicz, D.; Skonieczna, M.; Krzywicka, K.; Dziedzic, E.; Staniszewsaka, K.; Bicz, W. (Dep. Drug Metab., Inst. Biopharm., Med. Acad. Warsaw, PL-02-097 Warsaw, Poland) **Effect of organophosphorus insecticides on the oxidative processes in rat brain synaptosomes.** *J. Neurochem.* 34(3): 619-626; 1980 (25 references).

The effects of the organophosphorous insecticides Dipterex (trichlorfon), DDVP (dichlorvos), ronnel, and its oxygen analogue (prepared by peracetic oxidation of ronnel) on rat brain synaptosomal fractions were investigated. Dipterex and DDVP in concentrations of 5, 50, or 500 μM did not affect the rate of oxygen uptake and oxidative phosphorylation in the synaptosomes. Ronnel at a concentration of 500 μM inhibited cellular respiration and abolished the respiratory control of ADP by changing cytochrome *c* oxidase activities. The oxygen analog of ronnel (OAR) at 50 μM increased the rate of respiration in synaptosomes supplied with glutamate and malate as substrates. OAR at 50-500 μM concentrations inhibited cytochrome *c* oxidase and NADH-cytochrome *c* oxidase activities, and inhibited respiration as well. These findings suggest that disturbances of oxidative processes may be involved in the toxicity of organophosphorus insecticides.

80-1465. Truchot, R.; Mounie, J. (Lab. Biochim. Pharm., Fac. Sci. Pharm. & Biol., F-2133 Dijon, Cedex, France) **Effets d'inducteurs: Sur le cytochrome P 450 microsomal et la glycerolphosphate deshydrogenase hepatiques chez le rat normal ou thyroidectomise, traite ou non par la 3,5,3'-triiodo-L-thyronine. [Comparison of the effects of some inducers: phenobarbital, dichlorodiphenyltrichloroethane and naphthacene, on microsomal cytochrome P 450 and mitochondrial glycerolphosphate dehydrogenase levels in the liver of normal or thyroidectomized rats after treatment by triiodo-3,5,3'-L-thyronine.]** *J. Pharmacol.* 10(4): 325-336; 1979 (27 references) (French).

A small effect was noted on the cytochrome P 450 level in liver microsomes after either thyroidectomy or treatment by triiodo-3,5,3'-L-thyronine (L-T3). Thyroid hormones were found to alter the effects of some enzyme inducers on liver cytochrome P450 concentration. In rats which had been treated with DDT, thyroidectomy caused the production of a high liver cytochrome P450 concentration. Rats treated with phenobarbital showed similar results. Treatment with L-T3 restricted this finding. Glycerophosphate dehydrogenase activity in the liver mitochondria was strongly stimulated by L-T3. Thyroidectomy decreased this activity. Rats simultaneously treated by DDT and L-T3 or by naphtacene and LT-3 showed a strong reduction in the influence of L-T3.

80-1466. Wu, C. H.; Oxford, G. S.; Narahashi, T.; Holan, G. (Dep. Pharmacol., Med. Sch., Northwestern Univ., Chicago, IL) **Interaction of a DDT analog with the sodium channel of lobster axon.** *J. Pharmacol. Exp. Ther.* 212(2): 287-293; 1980 (22 references).

Single giant axons of the lobster *Homarus americanus* were used to study interactions of a new degradable DDT analog, 2,2-bis-(*p*-ethoxyphenyl) -3,3-dimethyloxetane (EDO) with the sodium channel. The isolated axon was continuously perfused with artificial seawater containing 2 to $10 \times 10^{-5} M$ EDO, and membrane currents were measured under voltage clamp conditions. Results indicate that EDO has specific actions on the sodium conductance of lobster axon membranes. EDO prolongs the falling phase of action potential without affecting the resting potential. Under voltage clamp conditions, the sodium current is reduced in peak amplitude and slowed in the falling phase, with an increased residual current during prolonged depolarization. The tail current associated with repolarization is markedly slowed. The steady-state sodium activation and inactivation curves are shifted in the direction of hyperpolarization, while the time constant of sodium channel activation is not affected by the drug. Possible mechanisms for the observed effects are discussed.

80-1467. Pritchard, J. B. (Lab. Pharmacol., NIEHS, Research Triangle Park, NC) **Accumulation of anionic pesticides by rabbit choroid plexus *in vitro*.** *J. Pharmacol. Exp. Ther.* 212(2): 354-359; 1980 (39 references).

The rabbit choroid plexus was used to determine whether 2,4-D and the polar DDT metabolite 2,2-bis(*p*-chlorophenyl) acetic acid (DDA) are transported by choroid plexus, and whether these compounds are effective inhibitors of 5-hydroxy-3-indoleacetic acid (HIAA) transport by choroid plexus. Each plexus was incubated *in vitro* with ^{14}C labeled 2,4-D or DDA, followed by liquid scintillation assay. Both compounds were extensively accumulated, with uptake being energy and concentration dependent. After 60 min incubation at 37°C with 1 μM pesticide, tissue-to-medium ratios of 40 (DDA) to 50 (2,4-D) were found. Uptake is apparently mediated by the organic acid transport system, since 2,4-D and DDA each produced dose dependent inhibition of the uptake of the other. Both pesticides produced dose dependent inhibition of HIAA transport, with DDA being a slightly more effective inhibitor than 2,4-D. It is suggested that further studies should be carried out to evaluate the potential of 2,4-D and DDA on central nervous system toxicity.

80-1468. Reuber, M. D. (Frederick Cancer Res. Cent., NCI, Frederick, MD) **Carcinogenicity of toxaphene: a review.** *J. Toxicol. Environ. Health* 5(4): 729-748; 1979 (23 references).

Seven studies on the carcinogenicity of toxaphene in animals are reviewed. Toxaphene was found to be highly carcinogenic in rats and mice. Toxaphene induced malignant hepatic neoplasms and increased neoplasms at all sites in rats and mice. Neoplasms of the endocrine organs were increased in treated male and female rats. Sarcomas, the incidence of mammary gland neoplasms, interstitial fibrosis of the kidney and atrophy of the testes were increased in male rats given toxaphene. Neoplasms of the reproductive system and carcinomas were increased in treated female rats. Leukemia and lymphosarcoma in treated male mice and sarcomas of the uterus in treated female mice were also observed.

80-1469. Lekveishvilli, N. I. (Georgian Res. Inst. Plant Prot., Digomi, USSR) **Deistvie fosfamida i karbofosa na esterazy tsitrusovoi belokrylki. [Effect of phosphamide and carbophos on esterases of citrus whitefly.]** *Khim. Sel'sk. Khoz.* 18(1): 39-41; 1980 (7 references) (Russian).

In an attempt to evaluate the mechanism of resistance of citrus whitefly to organophosphorous insecticides, sensitive (S) and resistant (R) populations of the pest were treated with phosphamide (dimethoate) and carbophos (malathion) at concentrations ranging from 0.1% to 0.006% and esterases activity in Stage III larval was determined. In control (without insecticides), activity of esterases in sensitive populations was almost similar to that in resistant populations. Activity of cholinesterase, as well as of methylbutyrateesterase (MBE), and tributyrinase (TBA) in larvae from both populations decreased with increased concentrations of both insecticides. Cholinesterase in larvae from resistant populations was almost 2-fold more resistant to insecticides. MBE in larvae from resistant populations was resistant to phosphamide but sensitive to carbophos. These findings indicate that resistance of citrus whitefly populations is associated with carboxyesterases.

80-1470. Vizethum, W.; Dahlmann, D.; Bolsen, K.; Goerz, G. (Univ. Hautklinik, Duesseldorf, BRD) **Wirkung von chloroquin auf die Hexachlorbenzol (HCB)-induzierte Porphyrie der Ratte. [Effect of chloroquin on HCB-induced porphyria in the rat.]** *Med. Welt* 30(18): 717; 1979 (German).

Hepatic porphyria was induced in rats by HCB. Some of these animals were treated treated with chloroquin. The treatment caused a transient normalization of the porphyrin precursors (ɗ-aminolevulinic acid and porphobilinogen) and a reduction of the porphyrin excretion by about 50%. The porphyrin levels in the liver and skin decreased continuously.

80-1471. Garcia Fernandez, J. C.; Koch, O. R.; Bijovsky, T.; Casabella, A.; Acevedo, C.; Mino, J.; Villaamil, E. (Dep. Farmacol. & Toxicol., Univ. Buenos Aires,

Buenos Aires, Argentina) **Alcohol y plaguicides. I. Metabolismo del aldrin e histologia hepatica en ratas tratadas cronicamente con alcohol y aldrin. [Alcohol and pesticides. I. Metabolism of aldrin and hepatic histology in rats chronically treated with alcohol and aldrin.]** *Medicina (Buenos Aires)* 39(6): 819-820; 1979 (Spanish).

The effects of aldrin (30 ppm in the diet), ethanol (32% solution *ad libitum*), and their combination were studied in male Wistar rats. Group A received the basic diet with alcohol and sucrose; Group AP received the basic diet with alcohol and aldrin; Group SP received the basic diet with an isocaloric amount of sucrose and with aldrin, and Group C was kept on the basic diet. The animals were treated for 10 wk and sacrificed immediately. The alcohol consumption was about the same in all groups (about 41% of the total calorie intake). Aldrin alone caused marked fatty degeneration of the liver, but no lipid deposits were seen in the liver in Group AP. The blood dieldrin levels were 37.3 ppm in Group AP and 27 ppm in Group SP. Dieldrin levels in the fatty tissues were 20.1 ppm in Group AP and 12 ppm in Group SP. Aldrin was not found in any group, and dieldrin was not found in the groups not treated with aldrin. The findings indicate the immediate metabolism of aldrin into dieldrin, the accumulation of considerable residue levels of the metabolite in alcohol-treated animals, and the marked effect of alcohol on the dieldrin level in the blood.

80-1472. Podstavkova, S.; Miadokova, E.; Vlcek, D.; Vargova, M. (Dep. Genet., Fac. Nat. Sci., Bratislava, Czechoslovakia) **Toxic and potentially mutagenic effect of the systemic fungicide Trimorfamid when tested on microorganisms.** *Mutat. Res.* 77(2): 181-184; 1980 (14 references).

Salmonella typhimurium, strains TA98 and TA100, and *Escherichia coli*, strains WP2 and WP2 uvrA, were used to test the mutagenic effects of 100, 200, 500 and 2000 μg Trimorfamid (AI in 20% emulsion)/plate. The average number of *E. coli* Trp^+ revertants and *S. typhimurium* His^+ revertants with and without S9 activation mix were counted. No induced mutation frequencies were observed over the frequency of spontaneous revertants. Streptomycin resistant *Chlamydomonous reinhardii* cells were used to test the toxicity and mutagenicity of 100, 1000 and 5000 μg Trimorfamid (crystalline technical formulation)/ml in another test. For control, positive controls (UV and DMSO treated) and Trimorfamid (at 100, 1000 and 5000 μg) the percent survivals were 93.82, 8.78, 72.83, 54.33, 20.08 and 10.59% respectively. Although a toxic influence was noted, the frequency of streptomycin resistant mutants in the survivors indicated no mutagenic effect of Trimorfamid.

80-1473. Vasudev, V.; Krishnamurthy, N. B. (Dep. Post Grad. Stud., Univ. Mysore, Mysore 570006, India) **Non-mutagenicity of the fungicide Dithane M-45 as inducer of recessive lethals after larval feeding in *Drosophila melanogaster*.** *Mutat. Res.* 77(2): 189-191; 1980 (8 references).

The induction of sex-linked and autosomal recessive lethals in *Drosophila melanogaster* were used as indicators of the mutagenicity of Dithane M-45 (mancozeb). Male flies emerging from 5, 10, and 15 mg Dithane M-45/100 ml food media and from normal media were individually crossed to virgin females. F_2 and F_3 offspring were tested for sex-linked and autosomal recessive lethals and suspected positives were retested. No increased frequencies of sex-linked recessive lethal mutations were observed ($p > 0.05$, 3). At 15 mg/100 ml a slight increase (average 0.204% lethals in treated flies and average 0.115% in controls) was observed but was not significant. Percent autosomal recessive lethal frequences were 0.263, 0.259, 0.280 and 0.315% at 0, 5, 10 and 15 mg/100 ml, respectively. These values were not significant at the 5% level by the χ^2 test. Mutagenic activity of Dithane M-45 was not demonstrated under these conditions.

80-1474. NCI, Bethesda, MD 20014 **Bioassay of dimethoate for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 4: 76 pp.; 1977 (10 references).

Osborne-Mendel rats were given time-weighted average doses of 155 or 310 ppm dimethoate for males and 192 or 384 ppm doses for females for a period of 80 wk in their feed. Female mice were given diets containing 250 or 500 ppm dimethoate for 80 wk. Male mice were given the same doses but for periods of 60 or 69 wk only. Dimethoate treated animals experienced tremors and hyperexcitability. No statistically significant increase was noted in tumors which were attributable to the dimethoate treatment. It was thus concluded that the chemical was not carcinogenic under the conditions of this test.

80-1475. NCI, Bethesda, MD 20014 **Bioassay of dichlorvos for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 10: 98 pp.; 1977 (17 references).

Osborne-Mendel rats and B6C3F1 mice were given dichlorvos in their diets at 2 concentrations for periods of 80 wk. Time-weighted average doses for both males and females were 150 and 436 ppm for rats and 318 and 635 ppm for mice. No toxic signs were noted which were directly attributable to dichlorvos. Average weight gains were slightly depressed. No dose-relation to survival was noted. No significant increase in the incidence of tumors was noted. Under the conditions of these studies dichlorvos was not found to be carcinogenic.

80-1476. NCI, Bethesda, MD 20014 **Bioassay of photodieldrin for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 17: 97 pp.; 1977 (15 references).

Male and female Osborne-Mendel rats were given photodieldrin at doses of 5 or 10 ppm for 80 wk. Doses to female rats were reduced after 30 wk. The time-weighted average doses for female rats were 3.4 or 7.5 ppm. B6C3F1 mice were given doses of photodieldrin of either 0.32 or 0.64 ppm. Convulsions and hyperactivity were observed in treated male and female rats and in male mice. No effect on mortality rates was noted. A dose-related trend was noted in benign tumors of the mammary gland in female rats. Adenocarcinoma of the mammary gland occurred in the low-dose treated females. Three papillary and follicular-cell adenomas and one papillary adenocarcinoma of the thyroid occurred in low-dose females. In male rats the incidence of hemangiomas was significantly increased. Tumors in mice were not significantly increased in number over controls. It was concluded that photodieldrin was not carcinogenic for Osborne-Mendel rats or B6C3F1 mice under the conditions of this bioassay.

80-1477. Ragunath, T. (Alkali & Chem. Corp. India, Bombay, India) **Dithiocarbamate fungicides based on methylamines.** *Pesticides* 12(7): XIX-XXII; 1978 (6 references).

The history of development and mode of action of dithiocarbamate fungicides can be divided into 2 groups: those which contain hydrogen at the nitrogen atom [nabam, maneb, Vapam (metham-sodium) and zineb] and those in which only N-C linkage occurs (ziram, ferbam, and thiram). The former group exhibits fungicidal activity by non-specific interference with the sulfhydryl enzymes of the fungal cells, while the fungitoxicity of the second group is based on the phenomenon of toxicity inversion, in which the formation of metal complexes occurs within the cells. The biologic uses of the most common dithiocarbamates are briefly described. An outline of the areas of toxicological research needed for the fungicides is presented.

80-1478. Paul, B. K.; Baruah, J. N.; Thyagarajan, G. (Reg. Res. Lab., Jorhat 785006, India) **Agrochemicals based on methylamines.** *Pesticides* 12(7): XXIV-XXXI; 1978 (12 references).

A review of methylamine-based pesticides used in Indian agriculture is presented. Among methylamine-based carbamate insecticides are carbaryl, carbofuran, propoxur and methiocarb; monocrotophos, dicrotophos, dimethoate and formothion are among the organophosphates; and other pesticides include dithiocarbamate fungicides [Vampam (metham-sodium), ferbam, thiram and ziram], urea and carboxylic acid herbicides, and rodenticides and rodent repellents. The LD50s of the compounds are tabulated with their structural formulas and year of introduction. The safety of the different pesticides are discussed, including the biotransformation of carbamate methylamines in mammals. Current and projected estimates of methylamine-based pesticide use are given.

80-1479. Krishnakumari, M. K.; Muktha Bai, K.; Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore 570 013, India) **Evaluation of acute oral toxicity of zinc phosphide in *Rattus norvegicus* (albino).** *Pesticides* 13(11): 33-35; 1979 (11 references).

Toxicity studies were performed on female albino rats to determine the acute oral toxicity of zinc phosphide. Partially starved rats were intubated with varying concentrations of the pesticide. Doses of 21 and 28 mg/kg caused 10% mortality after an average of 18 hr. The 38 mg/kg dose produced 20% mortality. At 51.0 mg/kg 60% of the test animals died. A dose of 68 mg/kg did not increase the percent mortality above 60%, but the average time of death decreased slightly from 36 hr to 34 hr. The LD50 was calculated to be 54.0 mg/kg and the LD90 was 119.0 mg/kg. There were no changes in food intake, body weight, hematology or relative organ weights due to the pesticide. However, some histopathological lesions were observed in the kidneys of animals treated with low doses of the pesticide.

80-1480. Agzamov, R. A.; Arifkhanova, S. I. (Sh. A Alimov Uzbek Res. Inst. Tuberc., Tashkent, USSR) **[Izuchenie vlianiya pestitsidov na tkanevye struktury legkikh i techenie eksperimental'nogo tuberkuleza. [Study of the effect of pesticides on the tissue structure of the lungs and on the course of experimental tuberculosis.]** *Probl. Tuberk.* (5): 61-65; 1979 (20 references) (Russian).

The effect of the pesticides phosphamide (PP; dimethoate) and hexachlorane (HC; BHC) on the immunomorphological processes in the lungs was studied in albino mice with experimental tuberculosis. The animals were inoculated iv with 0.001 mg Bovis 8 mycobacteria and were divided into two groups on day 12. Group 1 was subjected to daily administrations of PP po at 0.05 LD50 (12.5 mg/kg), 0.02 LD50 (5 mg/kg) or 1/PRL (permissible residue level; 2 mg/kg. Group 2 received daily administrations of HC po at 0.05 LD50 (7.5 mg/kg), 0.02 LD50 (3 mg/kg), or 1/PRL (1.5 mg/kg). At sacrifice the lung tissues were examined histologically and histochemically. The administration of PP and HC at toxic (0.05 LD50) and subtoxic (0.02 LD50) doses resulted in marked inhibition of the alveolar-macrophageal reaction in response to tuberculosis. The findings are indicative of the immunodepressive effect of the pesticides on T-lymphocytes. A weak lymphoid cellular reaction observed in HC exposed mice indicated HC inhibition of B-lymphocytes.

80-1481. Hirano, C.; Kiritani, K. (Dep. Agric. Chem., Kochi Univ., Kochi, Japan) **Paddy ecosystem affected by nitrogenous fertilizer and insecticides.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 197-206; 1975 (15 references).

Specific attention is given in this paper to the relationship between the application of chemicals to the field and the chemical composition of the rice plant, the effects of insecticide treatment on paddy ecosystems, and the residues detected both in and out of the paddy field. The food chain toxicity of lindane to *Lycosa* spiders is illustrated. In irrigated paddy water treated with 3 kg of 6% lindane/10 a, roots and stalks of rice plants had residues of 5.9 and 5.1 ppm total BHC, respectively, after 3 days. Leafhoppers, after feeding on the plants for 2 days, had 15.3 ppm total BHC and *Lycosa*, after feeding on contaminated leafhoppers for up to 10 days, contained 1.1 ppm total BHC. The maximum densities of *Lycosa* were inversely correlated with total BHC concentrations in rice grains. Average residues of total BHC, aldrin + dieldrin, endrin and total DDT in arable soils from Nakamura, Japan, in 1973 ranged from 0 ppb aldrin + dieldrin in orchard soils to 183 ppb total DDT in orchard soils.

80-1482. Webb, M. (Toxicol. Unit, MRC Lab., Carshalton, Surrey SM5 4EF, England) **Toxicology of heavy metals: the scientific basis for toxicological evaluation.** In: *Science for Better Environment. Proceedings of the International Congress of Scientists on the Human Environment, (HESC).* HESC, Science Council Japan, ed. (Pergamon Press; Oxford): pp. 510-517; 1975 (58 references).

Mercury enters the environment naturally to a small degree, but in far greater quantities through the use of seed-dressings. Heavy metal compounds with one free valency, such as methyl mercury, are the most toxic. Dimethylmercury is demethylated to the extremely toxic monomethyl compound. Other mercury compounds such as the alkoxyalkylmercury derivatives undergo cleavage of the metal-carbon bond rapidly *in vivo* and allow accumulation of mercury in various organs. Mercury contamination, although becoming more regulated, is still an environmental problem. In evaluating toxicological hazards one must consider the critical organs and concentrations, the conditions of exposure, and the rate of excretion or biological half-time. Present knowledge in most of these areas is as yet insufficient to allow definite conclusions to be drawn. It is noted that stress, nutrition, changes in the pattern of exposure, synergism and antagonism, and the interactions with other chemicals may also change the response of individuals to these toxic compounds.

80-1483. Kar, S.; Singh, P. K. (Lab. Blue-green Algae, Cent. Rice Res. Inst., Cuttack 753006, Orissa, India) **Effect of nutrients on the toxicity of pesticides carbofuran and hexachlorocyclohexane to blue-green alga, *Nostoc muscorum*.** *Z. Allg. Mikrobiol.* 19(7): 467-472; 1979 (17 references).

The toxicity of carbofuran and HCH (BHC) for the non target blue-green alga *Nostoc muscorum* was found to be reduced when concentrations of nutrients such as K_2HPO_4, $Ca(NO_3)_2$ and $CaCl_2$ were increased beyond normal levels. It is suggested that the nutrients may obstruct passage of the pesticide into the algal cell or interact with the pesticide to produce a less toxic product. When the nutrients were added in combination at higher concentrations the effect of individual treatment was antagonized, and the toxicity of the pesticides was enhanced.

See also 80-1204, 80-1205, 80-1215, 80-1222, 80-1233, 80-1243, 80-1255, 80-1271, 80-1281, 80-1284, 80-1296, 80-1302, 80-1304, 80-1306, 80-1307, 80-1308, 80-1310, 80-1311, 80-1312, 80-1315 *and* 80-1318.

80-1484. Ikeda, S., Satake, H. (Fac. Eng., Tokushima Univ., Tokushima, Japan) **[Iodometric potentiometric titration of dithiocarbamate.]** *Bunseki Kagaku (Anal. Chem.)* 28(12): T53-T56; 1979 (6 references) (Japanese).

An iodometric method for the rapid determination of salts of dithiocarbamates was developed. Potentiometric titration employed a platinum indicator electrode and a saturated calomel reference electrode. Dithiocarbamate salts can be titrated with 0.025 *N* I-KI standard solutions with 5% Triton X-100 under conditions of 10-15°C temperature and a pH of 7.5. Ten ml samples of 0.001-0.01 *M* dimethyldithiocarbamate dimethylammonium, 0.002-0.008 *M* Nadimethyldithiocarbamate (DDC), and 0.001-0.008 *M* concentrations of other dithiocarbamates were determined within < 0.3% relative deviation and coefficient of variation. The entire procedure can be completed in < 10 min.

80-1485. Crist, H. L.; Harless, R. L.; Moseman, R. F.; Callis, M. H. (Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Application of dehydrochlorination to the determination of toxaphene in soil and identification of the major gas chromatographic peak.** *Bull. Environ. Contam. Toxicol.* 24(1): 231-237; 1980 (5 references).

Toxaphene in soil at 0.1, 0.5, and 1.0 μg/g was determined by gas chromatography using a dehydrochlorination technique. After extraction of toxaphene from fortified soil samples using methanol: toluene (1:1), sample cleanup was performed on a Florisil column. Dehydrochlorination was carried out by reflux with a 43% KOH-methanol solution and the toxaphene derivative was extracted into hexane and eluted on a Florisil column. After comparison of the elution pattern with a dehydrochlorinated toxaphene standard, an appropriate volume of sample was injected into the gas chromatograph. A dehydrochlorinated toxaphene standard was also prepared by HPLC which corresponded to the retention time of the analytical peak obtained on the gas chromatographic column. GC-MS characterization of this major fraction revealed a polychlorinated bornadiene with a general formula of $C_{10}H_8Cl_6$. The dehydrochlorination step proved useful for the removal of interference from PCB and other organochlorine pesticides for quantitative determination of toxaphene. However, the use of this procedure for routine toxaphene determinations in biological samples is not yet recommended.

80-1486. LeBel, G. L.; Williams, D. T. (Monit. & Criteria Div., Environ. Health Dir., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario K1A 0L2, Canada) **Determination of low ng/l levels of polychlorinated biphenyls in drinking water by extraction with macroreticular resin and analysis using a capillary column.** *Bull. Environ. Contam. Toxicol.* 24(3): 397-403; 1980 (14 references).

A method is described for the analysis of PCBs in drinking water at the low ng/l levels. XAD-2 macroreticular resin cartridges were used for clean-up, and analysis was done by capillary column gas chromatograph with a ^{63}Ni electron capture detector. Recoveries of Arochlors 1254, 1242, 1016 and 1232 from samples at the 10 ng/l fortification level ranged from 86 to 99%, and at the 1 ng/l fortification level from 91 to 110%. Results are given of analysis of potable water samples from three well water sources suspected of contamination by Arochlor 1016. The interfering compounds were minimal, and the detection limit was estimated to be approximately 0.04 ng/l of Arochlor 1016. In potable water samples from a river source, interference from other organic compounds made quantitation more difficult. Arochlor 1254 was still detectable at the 1 ng/l level, but the limit of detection of Arochlors 1232, 1242, and 1016 was 10 ng/l.

80-1487. Mamarbachi, G. (Lab. Pestic., Serv. Prot. Environ. Quebec., Ste-Foy, Quebec G1P 3W8, Canada) **Recherche et dosage de l'aminocarb dans les eaux naturelles et le feuillage du sapin baumier par chromatographie en phase gazeuse. [Detection and determination of aminocarb in natural waters and foliage of balsam fir by gas chromatography.]** *Bull. Environ. Contam. Toxicol.* 24(3): 415-422; 1980 (10 references) (French).

A method is described for the determination of residues of the carbamate insecticide aminocarb (4-dimethylamino-m-tolyl methylcarbamate) in natural waters and in balsam fir foliage. After extraction of the insecticide from water with chloroform and from foliage with ethyl acetate, the extracts were purified by coagulation with an aqueous solution of ammonium chloride and phosphoric acid. This solution was partitioned with methylene chloride, neutralized with sodium carbonate, and extracted with chloroform before being injected directly into a gas chromatograph equipped with a dual nitrogen phosphorous detector. Average aminocarb recoveries were more than 90% from foliage and nearly 100% from water at fortification levels of 1 μg/g and 1 μg/l, respectively. The detection limit ranged from 0.002 to 0.005 μg/g for foliage, and was 0.01 μg/l for water.

80-1488. Cseh, J.; Tokai, G.; Toth, M. (Author address not given) **Foszfateszter-tartalmu novenyvedoszerek meghatarozasa automatikus analizatorral. [Determination**

of phosphate ester pesticides by means of an automatic analyzer.] *Elelmez. Ipar* 33(10): 382-389; 1979 (9 references) (Hungarian).

Determination of organophosphate ester pesticide residues in fruits and vegetables by means of an automatic analyzer (Technicon AutoAnalyzer) and the application of this method to the study of the penetration of phosphamidon into apples and of the effects of various technological processes on the phosphamidon residue levels in apples are described. The method is based on the inhibition of cholinesterase. Part of the enzyme is inactivated by the inhibition, and the free moiety of the enzyme can be determined by means of a suitable chromogenic reagent, using a suitable substrate (acetylthiocholine iodide, from which thiocholine iodide is released upon enzymatic degradation). The thiocholine iodide is reacted with 5,5-dithio-bis-(2-nitro) -benzoic acid, which yields yellow 5-thio-(2-nitro)-benzoic acid that can be determined photometrically at 420 nm. Harvested apples were treated with a 0.2% aqueous solution of phosphamidon (Dimecron) by means of a brush. About 25% of the pesticide applied was found on the skin after 168 hr; the rest was found in the flesh. Apples were brushed similarly to determine the decrease in the residue level during laboratory-scale technological processing 5 days later. The residue level was 12.8 mg/kg after peeling, 7.4 mg/kg after washing, 7 mg/kg after vacuum treatment (85-90°C under 550 mm Hg for 5-8 min), 5.8 mg/kg after heat treatment (15-20-20 min at 94-96°C), and 1.6 mg/kg 2 days after processing.

80-1489. Schulten, H. R.; Stoeber, I. (Inst. Phys. Chem., Univ. Bonn, D-4000 Duesseldorf 1, BRD) **Bestimmung und Identifizierung von Biociden des Phenylharnstoff, Carbamate und Thiocarbamattyps in Gewaessern durch Hochdruck-Flussigkeits-Chromatographie und Felddesorptions-Massenspektrometric. [Determination and identification of biocides of the phenylurea, carbamate and thiocarbamate type in surface waters by high pressure liquid chromatography and field desorption mass spectrometry.]** *Fresenius Z. Anal. Chem.* 293(5): 370-376; 1978 (24 references) (German).

The combined application of high pressure liquid chromatography and field desorption mass spectrometry for the determination and identification of phenylurea and carbamate herbicides in surface water (Rhine river) is described. Following a selective pretreatment for purification, the substances isolated from the water samples are quantitated by high pressure liquid chromatography. For identification of the biocides the use of low- and high-resolution field desorption mass spectrometry is reported for the first time. Reliable identification of the pesticides from prepurified extracts of water samples is achieved with sample amounts of some nanograms (corresponding to 10-20 ppt concentration in the river water sample). (Author abstract by permission)

80-1490. Sharma, R. C.; Bhaskaran, M.; Bhide, N. K. (Dep. Pharmacol., All-India Inst. Med. Sci., New Delhi 110016, India) **A simplified chemical method of DDT estimation in the body fat.** *Indian J. Exp. Biol.* 17(12): 1367-1370; 1979 (15 references).

DDT-treated fat samples were titrated with sand and anhydrous Na_2SO_4, distilled rectified spirit was added and the mixture was filtered after 24 hr at room temperature. Filtrates of three extractions were combined and evaporated in a steam bath. Chloroform was used to dissolve the residue and Na_2SO_4: H_2SO_4 was shaken with the extracts until the acid layer was colorless. The chloroform layer was then evaporated, separated with petroleum ether: ether (4:1), and the solvent layer was treated with KOH, re-evaporated and dissolved in benzene with alcoholic KOH. The optical density of the solution was determined at 600-640 nm on a red filtered colorimeter. The blue color of the tetranitro derivative of DDT, determined over the concentration range 5-280 μg, was stable for 15 min. Percent average recovery was 67% and calculated DDT levels in butchered goats were 0.5-1.6 mg/kg fat. The correction factors used in the method are discussed.

80-1491. Baldi, M.; Bovolenta, A.; Zanoni, L. (Cent. Prev. Intossicazioni Fitofarm., Lab. Prov., Ferrara, Italy) **La determinazione dei residui di pesticidi organoclorurati non ionici nelle acque reflue industriali. [Determination of nonionic organochlorine pesticides in industrial effluents.]** *Inquinamento* 21(11): 55-58; 1979 (7 references) (Italian).

The gas-chromatographic determination on nonionic organochlorine pesticide residues in industrial effluents is described. Following extraction with methylene chloride and concentration in a rotary evaporator, the residue is cleaned up in a column containing Florisil, Celite 545, Attaclay, activated carbon, and anhydrous sodium sulfate. Acetone and methylene chloride are used for elution. The eluate is evaporated to dryness and the residue is dissolved in n-hexane and subjected to gas-chromatographic analysis with electron-capture detector. The column filling is W AW-DMCS with QFI and DC-200; the column temperature is 200-210°C, the injector temperature 250°C, and the ECD temperature 280°C. The recovery rate was found to be 91.8-102% for lindane, 91.8-101.5% for heptachlor, 95-100% for aldrin, 97.3-95.5% for heptachlor epoxide, 80.3-92% for DDE, 88.3-85.5% for dieldrin, and 85.72-89.80% for *p,p′*-DDT. The sensitivity of the method is 10 pg for lindane, heptachlor epoxide, and DDE; 15 pg for heptachlor and aldrin; and 20 pg for dieldrin and *o,p′*-DDT.

80-1492. Cooke, M.; Nickless, G.; Roberts, D. J. (Dep. Inorg. Chem., Univ. Bristol, Bristol BS8 1TS, England) **Carbon skeleton-gas chromatographic techniques and their applications.** *J. Chromatogr.* 187(1): 47-55; 1980 (27 references).

The hydrodechlorination reaction whereby organochlorine compounds such as DDT, polychlorinated biphenyls, polychlorinated naphthalenes and polychlorinated alkanes are converted to their respective hydrocarbons, 1,1′-diphenylethane, biphenyl, naphthalene and *n*-alkanes, may be performed by placement of the catalyst in the injection port of the gas chromatograph. This method is suitable for relatively simple samples. For more complex mixtures, that is, those where the parent hydrocarbons are present in addition to the polychlorinated species, a forked column arrangement, allowing with and without catalysis quantitation to be performed, is necessary. For capillary gas chromatography, a simple off-column catalytic reactor system may be used. This technique is particularly useful for the study of very complex polychlorinated alkane compounds. (Author abstract by permission)

80-1493. Van der Poll, J. M.; de Vos, R. H. (Cent. Inst. Nutr. & Food Res., TNO, Zeist, The Netherlands) **Improved determination of dalapon residues in plant tissues and natural water by derivatization and electron capture gas chromatography.** *J. Chromatogr.* 187(1): 244-248; 1980 (4 references).

The 3-phenylpropyl ester of dalapon was found to have good sensitivity and the highest retention time by gas-liquid chromatography (GLC) for use in measuring dalapon residues. Known amounts of dalapon were added to untreated plant and water samples. Plant tissue was treated with dilute *o*-phosphoric acid and 25% phosphotungstic acid, homogenized, and filtered; the filtrate and washings were saturated with NaCl and extracted with diethyl ether; and the extracts were dried over anhydrous Na_2SO_4. Natural water was treated in a similar manner. 3-Phenyl propanol-1 was added to the ether extract and the extracts were evaporated until no diethyl ether was left. The residue was saturated for 5 min with dry HCl gas; attached to a condenser and placed for 5 min in a steam bath. Hexane was added through the condenser after cooling and the tube was shaken. Water was then added and the tube shaken again. The mixture was separated; the hexane layer was extracted twice and filtered. After column clean-up, GLC with electron capture detection was performed on a 3% OV-210 packed Gas-Chrom Q column. Detection was linear up to nanogram amounts of the injected ester. Limits of detection were 0.2 mg dalapon/kg plant tissue and for water, 0.001 mg/l. Percent recoveries ranged from 86% for 0.16 mg dalapon/kg grasses to 103% for 0.05 mg dalapon/kg grasses.

80-1494. Defek, P.; Pacakova, V.* (Dep. Anal. Chem., Fac. Sci., CS-12840 Prague 2, Czechoslovakia) **Comparison of the high-performance liquid chromatographic behavior of *s*-triazine derivatives on various stationary phases.** *J. Chromatogr.* 187(2): 341-349; 1980 (25 references).

The high-performance liquid chromatographic behavior of 23 *s*-triazine derivatives was studied using LiChrosorb SI-5 as the stationary phase and 2-4% isopropanol in *n*-pentane as the mobile phase. The chromatographic data obtained were correlated with both the structures of the stationary phases and the polarities of the mobile phases that have been used so far for the analysis of *s*-triazines. Some of these relationships can be useful for the identification of *s*-triazines. (Author abstract by permission)

80-1495. Greenhalgh, R.; Cochrane, W. P. (Chem. & Biol. Res. Inst., Agric. Canada, Ottawa, Ontario K1A OC5, Canada) **Use of chlorpyrifos as an evaluation standard for gas chromatographic detectors.** *J. Chromatogr.* 188(2): 305-313; 1980 (20 references).

The performance of a range of element-selective detectors was studied using chlorpyrifos as a standard. It involved determination of the minimum detectable amount and linearity of the response of the flame photometric, alkali flame ionization, Hall electrolytic conductivity and electron capture detectors. The minimum detectable amount varied with both the model and type of detector, with the electron capture detector (frequency modulated mode) being the most sensitive and the flame photometric detector (S-mode) the least. A study of various models of electron capture detector demonstrated the superior performance of the frequency modulated type to the dc or dc pulse mode in both sensitivity and linearity. The responses of various types of alkali flame ionization detector were similar and *ca* 10 times more sensitive than the flame photometric detector (P-mode). The N/P response of the alkali flame ionization detector was dependent on the hydrogen flow-rate. The multi-element response of the detector is suppressed by using a flame energized source. The response of the flame photometric detector to chlorpyrifos analogues showed a variation in the minimum detectable amount of 2.1-4.5 for the P=O/P=S ratio, which indicated it to be a detector effect. The results obtained warrant the consideration of chlorpyrifos as a common evaluation standard for the sensitivity and linearity data of gas chromatographic detectors used in pesticide analysis. (Author abstract by permission)

80-1496. Farrell, T. J. (US FDA, Div. Chem. Technol., Washington, DC 20204) **Glass capillary gas chromatography of chlorinated dibenzofurans, chlorinated anisoles, and brominated biphenyls.** *J. Chromatogr. Sci.* 18(1): 10-17; 1980 (37 references).

The use of glass capillary gas chromatography (GC) is offered as a solution to problems encountered in the analysis of halogenated hydrocarbons in the environment and in the food supply. The determination of 2,3,7,8-tetrachlorodibenzofuran in monkey feed at the 5 ppb level is given as an example of GC trace analysis. GC has been

useful for qualitative and quantitative analysis in cases where isomers that are difficult to separate had to be determined by electron capture detection, and where there were large differences in electron capture response for isomers. Use of hydrogen as a carrier gas was very important when analyzing polyhalogenated hydrocarbons of low volatility.

80-1497. Khan, M. A.; Paul, J. (Chem. Dep., Univ. Bridgeport, Bridgeport, CT 06602) **Thin-layer chromatographic separation of aldrin, dieldrin, γ-hexachlorocyclohexane, malathion, ethyl-parathion, pentachlorophenol, and of chlordane, dieldrin, γ-hexachlorocyclohexane, malathion, ethyl-parathion, and pentachlorophenol from each other.** *Microchem. J.* 24(3): 333-340; 1979 (18 references).

The thin-layer chromatographic method reported was successful for the separation of aldrin (or chlordane), dieldrin, γ-hexachlorocyclohexane (lindane), malathion, ethyl-parathion (parathion) and pentachlorophenol (PCP) from each other. The maximum number of separations that could be obtained was 6 compounds out of a mixture of 7. Chlordane and aldrin had similar R*f* values and could not be separated from each other. When mixed with the other pesticides in the absence of the other, chlordane or aldrin, simultaneous isolation of the 6 compounds was obtained. The best solvent system was n-hexane: xylene: benzene: toluene: cyclohexane: methyl cyclohexane (50: 50: 50: 50: 50: 50).

80-1498. Zimmerli, B.; Zimmermann, H. (Bundesamt Gesundheitswes., Bern, Switzerland) **Einfaches Verfahren zur Schaetzung von Schadstoff-konzentrationen in der Luft von Innenraeumen. [Simple method for estimating concentrations of noxious substances in indoor air.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 70(4): 429-442; 1979 (29 references) (German).

A simple method of estimating indoor concentrations of noxious substances by exposing filter paper discs, impregnated with a suitable adsorbent, to the atmosphere and determining the adsorbed quantity of the active agent is described. If the adsorbent behaves as an ideal sink then the amount of active agent adsorbed in stagnant air per unit of time and surface is dependent only on atmospheric concentration. Application of the method is demonstrated on pentachlorophenol (PCP) from impregnated wall paneling. The procedure includes use of a disc impregnated with paraffin oil and subsequent determination of the absorbed PCP (converted by diazomethane to pentachloroanisol) by gas chromatography according to the formula J = kc where J = amount of chemical adsorbed, c = concentration in the air and the constant determined experimentally. The method is adequate to yield an order of magnitude above the potential health risk concentration.

80-1499. Noll, M. (Dortmund, BRD) **Ein biochemischer Test zum wirkungsspezifischen Nachweis von insektiziden Phosphorsaeureestern. [Biochemical test for specific activity detection of phosphate insecticides.]** *Prax. Naturwiss. Biol.* 28(3): 62-65; 1979 (3 references) (German).

A method for the detection of cholinesterase inhibiting toxic substances, such as the organophosphate ester dimethoate, is described. The solution of the inhibitor, dissolved in acetone or alcohol, is applied on a slide. The solvent is evaporated, and test serum (Precinoru U, Boehringer) is applied on the residue and on a free area of the slide. The cholinesterase inhibitor is detected by means of a cholinesterase containing test bar (Merckognost) from the changes in the color of the test bar. The method is suggested to be suitable for didactic purposes.

80-1500. Eichner, M.; Renner, R. (Chem. Landesuntersuchungsanstalt, D-7600 Offenburg, BRD) **Schnelle Rueckstandsbestimmung bei pflanzlichen und tierischen Lebensmitteln sowie Tabak und Tabakerzeugnissen durch Sweep Co-Analyse. 2. Mitteilung: Herbicidrueckstaende. [Quick residue control of plant and animal food, tobacco and tobacco-products by Sweep-Co analysis. 2. Herbicide residues.]** *Z. Lebensm. Unters. Forsch.* 170(1): 1-4; 1980 (6 references) (German).

A Sweep-Co-Method for multi-residue analysis of herbicides in vegetables and fruits is presented. It is anticipated that this method will cut costs now inherent in currently used methods, both in cutting down the time required, and in the expense of materials used.

See also 80-1224 *and* 80-1281.

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